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Factors potentially influencing academic performance among medical students

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Lana Al Shawwa[1]
Ahmad A Abulaban[2]
Abdulrhman A Abulaban[3]
Anas Merdad[3]
Sara Baghlaf[3]
Ahmed Algethami[3]
Joullanar Abu-shanab[3]
Abdulrahman Balkhoyor[3]

[1]Department of Medical Education, College of Medicine, King Abdulaziz University, Jeddah, [2]Department of Medicine-Neurology, King Fahad National Guard Hospital, King Abdulziz Medical City, Riyadh, [3]Department of Medical Education, College of Medicine, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia

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Correspondence: Ahmad A Abulaban
Department of Medicine-Neurology, King Fahad National Guard Hospital, King Abdulaziz Medical City, PO Box 377033, Riyadh 11335, Kingdom of Saudi Arabia
Tel +966 11 801 1111 ext 14196
Fax +966 11 801 1111 ext 14229
Email neuroahmad@yahoo.com

Background: Studies are needed to examine predictors of success in medical school. The aim of this work is to explore factors that potentially influence excellence of medical students.

Methods: The study was conducted in the Medical Faculty of King Abdulaziz University during October 2012. A self-administered questionnaire was used. Medical students with a grade point average (GPA) ≥4.5 (out of 5) were included and compared to randomly selected medical students with a GPA <4.5, who were available at the time of the study.

Results: A total of 359 undergraduate students participated in the study. 50.4% of the sample was students with a GPA ≥4.5. No statistically significant difference regarding the time spent on outings and social events was found. However, 60.7% of high GPA students spend less than 2 hours on social networking per day as compared to 42.6% of the lower GPA students ($P<0.01$). In addition, 79% of high GPA students prefer to study alone ($P=0.02$), 68.0% required silence and no interruptions during studying time ($P=0.013$), and 47% revise their material at least once before an exam ($P=0.02$).

Conclusion: Excellent medical students have many different characteristics. For example, they do not use social networking for prolonged periods of time, and they have strong motivation and study enjoyment. Further studies are needed to examine whether these differences have a real impact on GPA or not.

Keyword: King Abdulaziz University KAU, medical school, study habits, exam habits

Introduction

A medical student's academic performance attracts the attention of all those involved in medical education. Many medical education stakeholders are concerned about students' performances as it reflects their various areas of interest. According to Alfayez et al,[1] those stakeholders are not only faculty members but also medical school selection committees, curriculum planners, and instructional designers.

Moreover, the improvement of students' achievements has always been one of the main goals of education. Many studies were conducted to identify the factors that affect (positively or negatively) student achievement. Identifying those factors and the correlation between them is a very complex process. House[2] found that student characteristics, their lifestyle, learning environments, and instruction activities contribute to their achievement. Credé and Kuncel[3] also found that study skills, study habits, study attitudes, and motivation for study exhibit relationships with academic performance.

Many studies have stated that the most important predictor of performance in medical school is both prior academic ability and English language proficiency.[1–3] In another study, the socioeconomic status is one of the factors that affects learning; the

author states that students learn better if they are from an above-average or average income family.[2]

Ferguson et al[4] stressed the importance of how students learn, and this concept seems to be a useful strategy for students who wish to succeed. They explained that surface, deep, and strategic learning styles seem to show some degree of trait stability. However, this is only a moderate effect, suggesting that learning styles can change. When it came to studying methodologies and its effects on academic performance, problem-based discussion encourages better integration of new information in the student's existing knowledge base, making the resulting knowledge more accessible and recallable.[5]

When it comes to the nonacademic factors influencing performance, Rhoads et al[6] and Rippey et al[7] reported that motivation appears to be an influencing factor in performance. Another simple indicator of study habits must surely be based on the estimates of the number of hours worked by a student in a typical week. It was reported that there is a fairly clear relationship between examination results and the amount of work done by students.[8] However, authors also added that quality as well as quantity of studying is equally important. They stated that long hours of obsessive but ineffective work would rarely lead to academic success. Regarding sleep habits, Johns et al[9] reported that low academic performance was significantly related to waking up late in the morning, particularly on weekends, and to subjectively poorer quality sleep, but not to the amount of sleep usually obtained.

There are many factors that serve as predictors of success after qualification to medical school. In this study, we aim to study the factors that potentially influence academic performance of excellent medical students. Most factors mentioned in the literature were evaluated, in addition to other factors (eg, exam habits).

Methods

The study sample was selected from medical students between third and seventh year at King Abdulaziz University, Faculty of Medicine, Jeddah, Saudi Arabia. Two groups of students were allocated based on their grade point average (GPA). The first group was medical students whose GPA is more than or equal to 4.5 (out of 5) while the second group consisted of students with less than 4.5 GPA. It should be noted that the students' data were treated as confidential and were never used outside of research purposes. The study was approved by the institutional review board.

Three focus groups were arranged to develop a questionnaire (Table S1). The focus group consisted of students with different GPAs, and each session lasted up to 90 minutes. Careful revising and adjusting of questionnaire items was done with each focus group. The last agreed upon questionnaire was developed and aimed to gather information in the following four areas: demographics, social life and lifestyle influence, students' study habits, and exam preparation habits.

Questionnaire development was followed by sending the questionnaire to a biostatistician and medical education experts for review. Names and contact numbers of all medical students with high a GPA were obtained through the faculty administration. A list contained 301 students (121 male and 180 female medical students). All students were approached to obtain their approval to participate in the study. Subsequently, the questionnaire was sent to students through electronic mail. Surveyshare.com was used for distribution of the questionnaires, and settings were optimized to only accept completed forms. During the period of October 9–19, 2012 only 60.13% (181 students) among the 301 students responded to the questionnaire. Only 87 (71.9%) male and 94 (52.22%) female students responded.

Regarding the second group, students with less than 4.5 GPA, 300 questionnaires were printed and distributed by hand during the same study period. Students in this group were informed that if they already filled out the questionnaire (by email) not to fill it out or participate again. One hundred and seventy-eight questionnaires were filled out and returned, making the response rate 59.33%. Each students in both groups was informed that the collected information would be anonymous.

A case control study between two nearly equal groups was conducted and analyzed using SPSS version 15. The data were tabulated and analyzed using chi-square statistics for categorical variables. The magnitude of significant associations is presented as *P*-values (<0.05), odds ratios, and the 95% confidence interval for the odds ratio.

Results

Profile of participants

A total of 359 students in different classes, from third year to seventh year, participated in the study. Of those, 48.75% were male students and 51.25% were female. About 50.42% of participants had GPAs greater than 4.5; this group represents "excellent students". Those with a lower GPA comprised 49.58% of total participants. The vast majority of surveyed students were single (95.8%), and only 4.2% of participants were married or divorced (Table 1).

Lifestyle and social factors

Family size, whether the student lives with family, and the presence of family problems and issues were all assessed, and they were found not significant ($P>0.05$).

Financial factors such as the monthly income of the family and that of the student, and whether the student was financially responsible for someone other than him/herself, were found not significant ($P>0.05$).

The mode of transportation, either public or private, and whether the student shares their vehicle with other family members or friends was found to have no significant relation with students' performance ($P>0.05$). However, interestingly, students with a lower GPA had a significantly lower responsibility to drive other family members. Only 33.15% of students with a high GPA were reported to have no responsibility to transport others in comparison to 44.94% of students with a lower GPA ($P=0.025$).

Other forms of responsibility including spending time performing house chores and also whether students spend time on their personal hobbies were found to have no significant correlation with performance in our sample ($P>0.05$). Spending time watching television and listening to music had no significant difference between the groups. However, time spent on different forms of social networking had a significant difference on the student's performance (Table 2). Other social and lifestyle habits are summarized in Table 2.

There was no significant difference between those who had a higher GPA and a lower GPA when it came to spending time on extracurricular activities and attending medical conferences ($P>0.05$).

Drinking caffeinated beverages and smoking had no significant difference between the two groups ($P>0.05$). Also, no significant difference was observed in regard to napping habits and sleeping hours ($P>0.05$).

Table 1 Demographic data of participants

Profile of participants	High GPA students N=181 (%)	Low GPA students N=178 (%)	Total N=359	*P*-value
Sex				
Male	87 (48.1)	88 (49.4)	175 (48.7)	0.795
Female	94 (51.9)	90 (50.6)	184 (51.3)	
Nationality				
Saudi	168 (92.8)	165 (92.7)	333 (92.8)	0.628
Non-Saudi	13 (7.2)	13 (7.3)	26 (7.2)	
Year of study				
3rd year	25 (13.8)	25 (14.0)	50 (13.9)	0.067
4th year	44 (24.3)	36 (20.2)	80 (22.3)	
5th year	60 (33.1)	49 (27.5)	109 (30.4)	
6th year	41 (22.6)	63 (35.3)	104 (29.0)	
7th year (internship)	11 (6.1)	5 (2.8)	16 (4.5)	
Social status				
Single	174 (96.1)	170 (95.5)	344 (95.8)	0.520
Married	6 (3.3)	8 (4.5)	14 (3.9)	
Divorced	1 (0.6)	0	1 (1.1)	

Abbreviation: GPA, grade point average.

Study habits

Interestingly, some motivational factors seemed to have a significant impact on student performance. One example is the enjoyment of studying. 44.75% of students with a high GPA reported that they enjoy studying and that this is an important motivational factor, while only 32.85% of students with a lower GPA responded similarly ($P=0.018$). What is more interesting is that 59.12% of students with a higher GPA (compared to only 14.6% of students with a low GPA) reported that high grades obtained previously act as an important motivational factor ($P=0.0001$). When it came to competing for a scholarship or a postgraduate training position in the university, 68.51% of students with high GPAs found it to be an important motivational factor ($P=0.0001$). Another significant negative factor is the lack of motivation, 20.79% of students with a low GPA reported that they do not feel motivated, and only 5.52% of higher GPA students reported similarly ($P=0.0001$). Other study motives are mentioned in Table 3.

Another interesting finding is that 79% of the students with a high GPA preferred to study alone. On the other hand, students with low GPAs are more likely to study with a colleague or in a study group ($P=0.027$). When it came to English proficiency, the lack of an appropriate grasp of the English language seems to be a significant negative factor, as only one student in the high-grade group admitted to being deficient in English while 10.11% of the students with a low GPA reported similarly ($P=0.0001$). Regarding studying hours during the day, there was no significant difference between the two groups ($P>0.05$). However, 15.47% of students with high GPAs stated they studied for longer hours during the weekend, where only 6.18% of students with low GPAs reported to study for more than 8 hours/day during the weekend ($P=0.06$) (Table 4).

No significant differences were found in regard to the sources of studying and information gathering such as books, handouts, videos, self-taken notes ($P>0.05$). This study also assessed different study skills between the two groups. Only highlighting and skimming or reading before attempting to memorize the material were significantly more commonly

Table 2 Lifestyle and social habits of students with high and low grade point average

Social and lifestyle characteristics	High GPA students N=181 (%)	Low GPA students N=178 (%)	Total	OR (95% CI)
Hours spent on TV, movies, and music				
<2 hours/day	91 (50.2)	84 (47.1)	175	0.63 (0.35–1.13)
3–4 hours/day	51 (28.1)	41 (23.0)	92	0.55 (0.29–1.05)
>4 hours/day	13 (7.1)	15 (8.4)	28	0.79 (0.32–1.93)
Do not spend time on such activities	26 (14.3)	38 (21.3)	64	–
Social networking				
<2 hours/day	110 (60.7)	76 (42.6)	186	0.81 (0.40–1.61)
3–4 hours/day	35 (19.3)	54 (30.3)	89	1.80 (0.84–3.85)
>4 hours/day	15 (8.2)	30 (16.8)	45	2.33 (0.96–5.65)
I do not use it	21 (11.6)	18 (10.1)	39	–
Time dedicated to hobbies				
Every day	49 (27.0)	52 (29.2)	101	1.40 (0.76–2.58)
Once every week	53 (29.2)	60 (33.7)	113	1.50 (0.83–2.72)
Every month	38 (20.9)	35 (19.6)	73	1.21 (0.63–2.34)
No hobby	41 (22.6)	31 (17.4)	72	–
Time spent with friends				
Every day	22 (12.1)	28 (15.7)	50	1.30 (0.64–2.64)
>3 times/week	37 (20.4)	26 (14.6)	63	0.72 (0.37–1.39)
<3 times/week	80 (44.1)	83 (46.6)	163	1.06 (0.63–1.80)
None	42 (23.2)	41 (23.0)	83	–
Time spent on extracurricular activities				
5 hours/week	5 (2.7)	7 (3.9)	12	1.10 (0.34–3.62)
<5 hours/week	16 (8.8)	14 (7.8)	30	0.69 (0.31–1.50)
1–2 events per year	81 (44.7)	57 (32.0)	138	0.56 (0.36–0.87)
None	79 (43.6)	100 (56.1)	179	–
Attendance of medical conferences				
>4 events/years	19 (10.4)	24 (13.4)	43	0.59 (0.36–0.98)
<4 events/years	125 (69.0)	103 (57.8)	228	0.92 (0.44–1.91)
None	37 (20.4)	51 (28.6)	88	–

Abbreviations: CI, confidence interval; GPA, grade point average; OR, odds ratio; TV, television.

used among students with high GPAs (P=0.047 and P=0.005, respectively) (Figure 1).

When assessing different study habits, it was found that 114 (62.98%) of the students with high GPAs were ensuring silence and no interruptions during studying (P=0.013) as compared to 89 (50%) of the lower GPA group. In addition, 40.3% of students with high GPAs seemed to favor a certain posture or body position, such a sitting or lying on the floor. However, students with a low GPA were less likely (29.7%) to commit to a certain comfortable position (P=0.036). Other habits such as drinking beverages, eating snacks, favoring a certain place, and listening to Qur'an or music were found not significant (P>0.05).

Table 3 Motive to study among medical students with high and low grade point average

Study motive	High GPA students N=181 (%)	Low GPA students N=178 (%)	OR (95% CI)
Study enjoyment	81 (44.8%)	58 (32.6%)	1.67 (1.09–2.57)
Pressure from family members	21 (11.6%)	22 (12.4%)	0.93 (0.49–1.76)
Seeking a scholarship/ academic job position	124 (68.5%)	87 (48.9%)	2.28 (1.48–3.50)
Previous high scores	107 (59.1%)	26 (14.6%)	8.45 (5.07–14.09)

Note: Students can select one or more options.
Abbreviations: CI, confidence interval; GPA, grade point average; OR, odds ratio.

No significant differences were observed between the two groups in regard to attendance of lectures, tutorials, practical sessions, and clinical teachings. However, attending problem-based learning (PBL) sessions showed significant difference between the two groups, where 82.1% of students with a high GPA score attended almost all PBL sessions alongside 68.0% of low GPA score students (P=0.0001).

This study also showed that 54.7% of students with a high GPA sought a solution independently when facing a difficulty during learning, in comparison to 40.5% of other students. In addition, the study showed that students with low GPAs are more likely to seek information from other students (P=0.012). When it came to preparing for the next

Table 4 Study habits among medical students with high and low grade point average

	High GPA students N=181 (%)	Low GPA students N=178 (%)	Total 359	OR (95% CI)
Group study preference				
Alone	143 (79.0)	121 (67.9)	264	2.81 (1.19–6.64)
With one of my colleagues	30 (16.5)	38 (21.3)	68	1.50 (0.88–2.56)
In groups	8 (4.4)	19 (10.6)	27	–
Studying hours/day				
<2 hours	52 (28.7)	60 (33.7)	112	0.96 (0.53–1.72)
3–4 hours	78 (43.0)	61 (34.2)	139	0.65 (0.37–1.14)
>4 hours	16 (8.8)	15 (8.4)	31	0.78 (0.34–1.80)
Do not study daily	35 (19.3)	42 (23.5)	77	–
Weekend studying hours/day				
<5 hours	75 (41.4)	79 (44.3)	154	0.54 (0.28–1.07)
5–8 hours	62 (34.2)	57 (32.0)	119	0.48 (0.24–0.96)
>8 hours	28 (15.4)	11 (6.1)	39	0.20 (0.08–0.51)
Do not study during weekends	16 (8.8)	31 (17.4)	47	–

Abbreviations: CI, confidence interval; GPA, grade point average; OR, odds ratio.

academic semesters, this study found that during vacations, students with high GPAs are more likely to start reading for subjects of the next year (13.8% versus 6.7%) (P=0.028). Also, they are more likely to use their vacation time to conduct research projects (13.8% versus 7.3%) (P=0.045). However, using the vacation for clinical training seems to have no significant reflection on performance or GPA (P>0.05).

Exam habits

No significant difference existed between the two groups in regard to the amount of time used to prepare for examinations (P>0.05). Around 16.29% of students with low GPA tend to sleep more during the examination periods, compared to only 5.52% of students with high GPA (P=0.002).

No significant differences between the two groups were found regarding changes in social activities during the examination period. This was also reported with the studying hours during the day and before the exam (P>0.05). Around 12.92% of students with a low GPA reported not having a chance to complete their study material before the exam, compared to only 2.76% of students with a high GPA (P=0.021).

About 19.12% of students with low GPAs tend to cheat during their exam, compared to only 8.29% (P=0.003) of high GPA students, and differences were found regarding helping other students to cheat from their own answers (P=0.05).

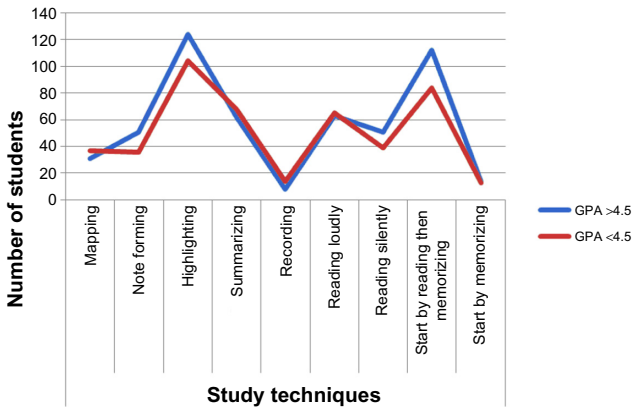

Figure 1 Study techniques preferred among the medical students.
Abbreviation: GPA, grade point average.

Discussion

It has been demonstrated from previous studies that family influences, such as family education and the presence of physicians in the family, affects the performance of students.[1] However family-related factors that were included in this study (such as family size and issues) did not show any significance. This might reflect that those factors might not directly affect students' motivation, available time for studying, and efficiency of their learning process. Also, a recent study from Saudi Arabia showed higher academic performance among female and married students, a finding that was not replicated by our data. However, medical students involved in that study were only in their preclinical year.[19]

Contrary to what was mentioned previously in the literature,[2] financial factors, such as income of the student and/or family did not have a significant effect on academic achievement in this study. This may be explained by the fact that all students receive a monthly allowance from the university. Also, it is the norm in our culture that the student remains under the care of the family until after graduation.

Due to the lack of appropriate public transportation, and the fact that it is illegal for women to drive in Saudi Arabia, it is quite common for male students to spend time driving female family members or even friends who do not own cars. However, barring such responsibilities did not significantly affect the GPA of the students in this study. It is possible that such responsibilities do not consume time to affect the performance of the student. This finding is similar to other forms of responsibility in our study, like house chores, extracurricular activities, and hobbies.

Also, spending time on watching television or listening to music did not affect students' performance. On the

other hand, a highly time-consuming activity like social networking did significantly affect the GPA of students who spend a significant amount of time on it. In this study, students with low GPA were reported to spend more time on social networks such as Facebook, Twitter, and texting.

When it came to study habits, this study found that 44.75% of students with high GPAs enjoy studying and consider it an important motivational factor. This finding is similar to what was reported in a study conducted by Pinyopornpanish et al,[10] which showed that lack of academic motivation in studying medicine was one of the factors associated with low academic achievement. Our findings might reflect that there is a relationship between enjoyment of studying and high academic achievements. Further studies that explore this correlation are needed.

The interaction between personality and environmental factors and their effect on academic achievement is a rather complex process. There are many variables involved and generalizations cannot be easily drawn. Academic success is not achieved by one single studying strategy; "good students" work effectively in quite diverse but characteristic ways. In this study, it was found that 79% of the students with high GPAs preferred to study alone. On the other hand, students with low GPAs are more likely to study with a colleague or in a study group. This finding might indicate that the overall productivity of group studying is less than studying alone. Moreover, when assessing different study habits, it was found that 62.98% of students with high GPAs favored silence and no interruptions during studying. That can emphasize the necessity of having private studying areas for the students within the university hospital.

When it came to the sources of studying and information gathering, no significant differences were found. Our study finding can be explained by the fact that study guides made available to our students contain multiple references and that lecture notes are also made available to our students.

Cortright et al[11] stressed the fact that students prefer information to arrive in a variety of modes, and that students do not learn by simply sitting in a classroom listening to the educator and memorizing assignments. To achieve meaningful education, the learning process must be interactive, hence allowing students to relate this knowledge to past experiences and apply it to their daily lives.

The latter might explain what this study revealed when assessing attendance of lectures and student academic achievement. In this study, there was no significant difference between the two groups of students in regard to attendance of lectures, tutorials, practical sessions, and clinical teachings. However, attending PBL sessions was associated with a higher GPA. Similar results were found in other studies. De Grave et al[5] explained, that problem-based discussion encourages better integration of new information in the student's existing knowledge base, making the resulting knowledge more accessible and remembered better.

This study showed no effect regarding the duration of preparation prior to the exam date on GPAs, similarly to number of hours of studying in the day before the exam proved of no effect on GPA score. It is important to note that no studies were found comparing number of hours studying versus studying quality and technique effect on high grades. Further studies should be conducted to fill this research gap. Also, social activity during exam period proved it has no effect on GPA score, positively or negatively.

Interestingly, the majority of the students (from both groups) sleep less than usual, but sleeping more than usual was reported of significant value among the group with low GPAs. However, in a study measuring sleep quantity versus sleep quality showed that average sleep quality was better related to health, balance, and feelings of tension, depression, anger, fatigue, and confusion than average sleep quantity.[12] Further studies should be conducted to assess sleep quality rather than quantity during exam periods.

On the night of the exam, sleeping an average of 2–6 hours or more than 6 hours was reported to have a positive effect among the group with higher GPAs. Furthermore, the majority of students from both groups reported that they can revise the subject only once before the exam, but revising it more than once has a positive effect on achieving higher GPAs. Most likely, repeated revisions further solidify the information in the student's memory and will make it easier and faster for the student to recall and use their knowledge whenever needed.

Cheating is more common among students with a lower GPA, which means that cheating has no role or, rather, is less needed to achieve a higher GPA.

Limitations

This study has some limitations. For example, factors assessed here were of possible association and do not mean direct causation. Also, all analysis was based on bivariate comparison (high versus low GPA).

Some individual variation does exist between people. The pattern of recommendation in this work does not necessarily fit everyone.

Another limitation is that people may read differently into each question and, therefore, reply based on their own interpretation of the question.

Conclusion

A number of factors seem to affect the GPA, such as social networking that will negatively affect the GPA. Also, having a strong motivation for achievement and a clear goal will positively affect the GPA. Choosing a quiet place and using study skills such as skimming before memorizing and note forming will positively affect the GPA. Attending PBL sessions and spending more hours studying during the weekend is associated with a higher GPA. In addition, ensuring enough sleep before exams and multiple revisions of the required material seems to positively affect the GPA of the student.

On the other hand, some factors were found to be insignificant, like family-related and financial factors. Also, spending time on hobbies and social life were insignificant. Finally, attending lectures and the time spent on studying during the weekdays and choosing between different sources of studying are not significant enough to affect the GPA.

Recommendations

Identifying different factors that would positively or negatively affect student performance is of utmost importance. We hope that our findings will trigger our university and other institutions to conduct larger studies to further deepen our knowledge on the topic. Also, we hope that results from our study and other studies may be used and implemented in our teaching strategies. We recommend reductions in the number of passive lecture hours offered and the use of patient-based clinical education in small student group settings. This strategy will allow students to be more active problem solvers. In addition, the strategy of using multiple teaching methods can help students develop different learning abilities and enjoy their learning experience.

Finally, we also would like to recommend developing a small "medical school preparation" course that would teach junior students different skills and effective study habits to help them make the most of their medical education. Such preparation courses are currently used in different universities to teach various skills such as critical thinking, note taking, and active reading, which are essential for effective learning during the university years.

Practical points

- Clear academic goals and motivations positively impact academic performance.
- Multiple revisions of the subject before the exams increases academic performance.
- Inappropriate use of social networking has a clear negative impact on GPA.
- Having a regular hobby and enjoying a normal social life does not significantly affect academic performance.

Disclosure

The authors report no conflicts of interest in this work.

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Supplementary material

Table S1 Self-administered questionnaire for medical students

1. Sex: ☐ Male ☐ Female
2. Nationality: …….
3. Year of study: a) 3 b) 4 c) 5 d) 6 e) house officer
4. Social status:
   a) Single
   b) Married
   c) Divorced
5. Total family number: ……..
6. Do you live with your family: a) Yes b) No
7. Did you have any family problems?
   a) Divorced parents
   b) Death of a first relative during your medical studying
   c) A family member with chronic illnesses
   d) I do not have any problem or death in my family
8. Monthly income of the family:
   a) <5,000 SR
   b) 5,000–20,000 SR
   c) >20,000 SR
9. Your monthly income:
   a) <1,000 SR
   b) 1,000–3,000 SR
   c) >3,000 SR
10. Are you financially responsible for any one in the family other than yourself?
    a) Yes b) No
11. Modes of transportation to college:
    a) Private driver.
    b) With a family member.
    c) I drive my own car.
    d) Public transportation (taxis).
12. Do you have to share your transportation method with others:
    a) Yes b) No
13. Are you responsible to drive other family members throughout the day?
    a) Yes b) No c) I do not drive.
14. Are you responsible for doing house chores (cleaning, shopping, etc)?
    a) Yes b) No
15. How many hours do you spend on movies, series, and music/day?
    a) <2 hours/day
    b) 3–4 hours/day
    c) >4 hours/day
    d) I do not watch television.
16. How many hours do you spend on social networking/chatting (online/BB) "not related to college work"?
    a) <2 hours
    b) 3–4 hours
    c) >4 hours
    d) I do not use it.

(*Continued*)

Table S1 (*Continued*)

17. Which of the following sentences is most accurate:
    a) I spend some of my time on my hobbies every day.
    b) I spend some of my time on my hobbies once every week.
    c) I spend some of my time on my hobbies at least once every month.
    d) I do not have a hobby.

18. Regarding smoking (cigarettes, cigars, Ma'asel, etc) habits:
    a) I am a smoker.
    b) I smoke at least once every week.
    c) I am a social smoker
    d) I do not smoke.
    e) I used to smoke but I quit.

19. Regarding consumption of caffeine containing beverages (coffee, Cola, Red Bull, etc), I:
    a) Regularly consume such beverages once every day.
    b) Regularly consume such beverages several times every day.
    c) I do not consume caffeinated drinks.

20. Regarding my social life (outside the university, only for the purpose of socializing), I:
    a) Spend time with my friends every day.
    b) Spend $\geq$3 times/week with my friends.
    c) Spend $<$3 times/week with my friends.
    d) Do not spend time with my friends.

21. Regarding extracurricular activities (volunteer and charity work, organizing committees, etc), I:
    a) Spend at least 5 hours/week on such activities.
    b) Spend less than 5 hours/week.
    c) Participate in 1–2 events every year.
    d) Do not spend time on extracurricular activities.

22. Regarding medical conferences and seminars, I:
    a) Attend less than four events/year.
    b) Attend more than four/year.
    c) I do not attend such events.

23. After university hours, I:
    a) Take a nap before studying.
    b) Do not take naps.

24. Regarding my sleeping hours/day: (including nap hours)
    a) I sleep $<$6 hours/day.
    b) I sleep 6–8 hours/day.
    c) I sleep $>$8 hours/day.

25. I am motivated to study harder because: (you can choose more than one)
    a) I enjoy studying.
    b) I have always had high scores.
    c) I feel pressured by my family.
    d) I want to get a scholarship/get hired by the university.
    e) I do not feel motivated.

26. When I study:
    a) I like to study alone.
    b) I like to study with one of my colleagues.
    c) I like to study in groups.

27. Regarding my English proficiency:
    a) I speak fluent English.
    b) My English is good enough to study and understand day-to-day conversations.
    c) My English is deficient, that I face some difficulties when I study.

(*Continued*)

Table S1 (*Continued*)

28. During the day, I study:
    a) <2 hours/day.
    b) 3–4 hours/day.
    c) >4 hours/day.
    d) I do not study daily.

29. During the weekends, I study:
    a) <5 hours/day.
    b) 5–8 hours/day.
    c) >8 hours/day.
    d) I do not study during weekends.

30. Arrange the following resources according to their importance in your studying: from 1 to 5, in which 1 is most important and 5 is least important:
    a) Internet b) Books c) Handouts d) My own notes e) Other (videos)

31. When I study I use the following: (choose the most important three)
    a) Mapping
    b) Note forming
    c) Highlighting
    d) Summarizing
    e) Recording
    f) Reading loudly
    g) Reading silently
    h) Start by reading then memorizing
    i) Start by memorizing

32. Rate the following according to your attendance
    1) 100% 2) 75% 3) 50% 4) 25% 5) I do not attend
    a) Lectures
    b) Tutorials
    c) Practical sessions
    d) Problem-based learning
    e) Clinical teaching

33. When facing difficulties during studying, I:
    a) Seek clearance independently (self-directed learning).
    b) Ask a colleague.
    c) Ask a faculty member.
    d) Skip it.

34. When I study, I: (you can choose more than one)
    a) Drink coffee.
    b) Eat snacks.
    c) Have to ensure silence and no interruptions.
    d) Favor a certain place (eg, I only like to study in my living room).
    e) Favor a certain body position (lying on the floor, sitting on a desk).
    f) Listening to Qur'an/music and television.

35. During vacations, I prefer to: (You can choose more than one)
    a) Start reading for the next year subjects.
    b) Have clinical training.
    c) Conduct research.
    d) Enjoy my vacation.

36. In a course of 2–3 months duration, I start preparing for the exam:
    a) 1 month before exam.
    b) 2–3 weeks before exam.
    c) Few days before exam.