The Correlation between Academic and Practical Achievements of a Group of Jordanian Dental Students

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Abstract

Objectives: In a country where admission to dental schools is based on academic achievement of students, the aim of the study is to investigate the correlation between the practical achievements and the academic performance of dental students. In addition to determining if a correlation exists between dental students' grades in the preclinical courses and their clinical performance.
Methods: Academic and preclinical/clinical grades were collected for third, fourth and fifth year students who graduated from the School of Dentistry at The University of Jordan, in 2014, and 2015. Two courses (operative dentistry and fixed prosthodontics) were selected. Correlations comparing academic and practical grades and correlations comparing preclinical and clinical grades were done for the total samples of third, fourth, and fifth year students for each course.
Results: Statistically significant weak to moderate positive correlations were found between academic and practical courses in each year and between the practical courses in preclinical and clinical years ($P < 0.01$).
Conclusion: The correlations and its degree indicate that achievement of students in practical dental courses could be partly influenced by their grades in theoretical courses and that their achievement in clinical courses could be partly predicted by their grades in preclinical practical courses. However, other confounding factors such as genuine artistic skills of students, factors related to supervisors of clinical sessions, patients' factors, and tolerability of student to cope with stress of practical or clinical sessions are additional factors that should be considered.

Keywords: Academic Achievement, Practical Achievement, Dental Students.

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Introduction

Dentistry is a multitasked profession which mandates knowledge in medicine and science, competence in art and dexterity skills, personal qualities and social intelligence. Intellectual abilities and cognitive components are fundamental elements for a successful dentist, but should not be the tool for prediction of academic performance and professional succes[(1)]; dentistry requires level of psychomotor skills[(2)].

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Each year dental schools face the challenge of an increasing number of applicants for available places, adding pressure on the educators to select the most appropriate method to ensure fewer students leave the program prematurely and a higher standard of dentists are produced[3].

Most dental schools in the developing world, base their admissions on the student's high school cumulative grade point average (GPA), whilst others add a specialized test like the dental admission test (DAT)[4,5]. Making admission based on achievement in math, science, and language[4], without assessment of the student's aptitude or manual skills[5]. Add to that, GPAs and DAT scores consistently show insignificant correlation with students' performance during preclinical courses[6-9], nor predict how well the students will perform during their dental education program[2,10].

In developing countries such as Jordan, universities depend in their admission procedure on the national high school examination results (GPA) or equivalent tests as the sole criterion for students' selection for dental schools.

Students in the Dental School at The University of Jordan are introduced to preclinical practical course in their third year. They perform several different operative procedures (cavity preparation, composite and amalgam fillings, rubber dam isolation, and matrices application, etc.) on typodont-mounted manikins. In year four they are required to perform crown preparation on typodont-mounted manikins, as part of their fixed prosthdontics course. At the end of year three clinical courses commence, and during years four and five they are subjected to all clinical courses. These courses have a theoretical counterpart in the form of lectures, presentations, and seminars, together with a practical preclinical/clinical part. In all of these above-mentioned courses, students learn different psychomotor skills and have to apply what was learnt during the theoretical part to their practical exercises.

Few studies, with inconsistent results, were conducted to look for correlations between dental students' academic grades and their practical clinical grades[2,11,12]. It was suggested that the complex nature of modern dental practice requires broad range of skills that digital dexterity contributes only a small increment, or that technical dental procedures are completely trainable in the course of dental education[11]. Inspite of the positive correlation which was found, it was course specific[12].

The aim of this study was to investigate the correlation between the academic achievements of dental students with their practical performance during their preclinical/clinical courses in operative dentistry and fixed prosthodontics. Moreover, to determine if a correlation exists between students' practical grades during their preclinical courses and their practical grades during their clinical courses in the same topics.

The authors will introduce a null hypothesis that there is no correlation between third/fourth/fifth year dental students' grades in theoretical courses and their grades in practical preclinical/clinical of the same course. The other assumption is the lack of correlation between third/fourth year dental students' grades in practical preclinical courses and their clinical counterparts in year five.

Materials and Methods

According to the ethics policy of the University of Jordan, ethics approval form to collect the needed data was signed and approved from the School of Dentistry and the Academic Research Committee of the University of Jordan.

Available academic and preclinical/clinical grades were collected for students who graduated from the School of Dentistry, The University of Jordan, in 2014 and 2015. Two courses given in third year (preclinical operative dentistry, academic and practical courses), two courses given in fourth year (preclinical fixed prosthodontics, academic and practical courses), and two courses given in fifth year (clinical operative dentistry academic and practical courses) were selected. No separate clinical fixed prosthodontics courses are given in fifth year in the current curriculum since fifth year clinical operative dentistry includes both operative and fixed prosthodontics procedures.

The academic grades for each year were achieved through theoretical computerized MCQs exams, first (25 marks), second (25 marks), and final (50 marks) exams. The preclinical grades for third and fourth years were collected cumulatively throughout the formative evaluations they attained in the laboratory (60 marks), and the summative evaluation (40 marks). Fourth and fifth year clinical grades were collected cumulatively throughout the year from the required dental procedures (requirements (60 marks)) in the clinics, together with the final OSCE exam (40 marks).

The results of these assessments, whether they are theoretical computerized exams or practical assessments are recorded on a continuous scale to 100, these grades are then converted to letters from A to F. Out of 4.00, A has a value of 4.00, A- as 3.75, B+ as 3.50, B as 3.00, B- as 2.75, C+ as 2.50, C as 2.00, C- as 1.75, D+ as 1.50, D as 1.00, D- as 0.75, and F as 0.00.

In all courses that were selected for the study, the marks of the same student were compared in his/her third, fourth, and fifth years. The marks of the first attempt, not the mark of the make-up exam in case the students failed the first attempt, were considered. The practical preclinical achievements for third year students and their practical clinical achievements in fourth and fifth years were studied.

In addition, the achievements of the student in each year in the academic and practical courses were compared.

All students who graduated from the School of Dentistry in year 2014 and 2015 were included in the study. The sample size is of 194 students; 44 males (22.7%) and 150 females (77.3%).

Statistical Analysis

Statistical analysis was performed using SPSS for Windows release 16.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were generated. Spearman's rho test was used to examine differences between groups. Cronbach's alpha test was used to evaluate the reliability and absolute agreement between academic and practical grades for each year. To label the strength of the association, for absolute values of rho, 0-0.19 was regarded as very weak, 0.2-0.39 as weak, 0.40-0.59 as moderate, 0.6-0.79 as strong and 0.8-1 as very strong correlation. Results were considered significant if P-values were less than 0.05.

Results

Descriptive statistics of their grades (out of 4.00) in the six studied courses (operative dentistry and fixed prosthodontics) are shown in (Table 1).

Statistically significant weak to moderate positive correlations were found between academic and practical (operative dentistry and fixed prosthodontics) courses in each year, and between the practical preclinical/ clinical courses in third, fourth, and fifth years ($P < 0.01$) as shown in (Table 2).

Table 1. Descriptive statistics of the grades obtained in the six courses (operative and fixed prosthodontics)

	3rd year theory	3rd year practical	4th year theory	4th year practical	5th year theory	5th year practical
Mean	2.85	2.80	2.70	2.84	2.88	2.76
Median	2.75	2.75	2.75	2.75	2.75	2.75
SD	0.64	0.71	0.72	0.68	0.54	0.67
Minimum	1.5	0.0	1.0	1.5	1.5	1.5
Maximum	4	4.0	4.0	4.0	4.0	4.0

SD: Standard deviation

Table 2. Correlations between the different grades

Correlations	3rd year practical		4th year practical		5th year practical	
	rho	P value	rho	P value	rho	P value
3rd year academic	**0.35***	< 0.01				
3rd year practical					**0.32***	< 0.01
4th year academic			**0.35***	< 0.01		
4th year practical	**0.51****	< 0.01				
5th year academic					**0.42****	< 0.01
5th year practical			**0.48****	< 0.01		

rho: Spearman correlation coefficient. * weak correlation, ** moderate correlation

Statistically significant weak positive correlations were found between academic and practical (operative dentistry and fixed prosthodontics) courses for third and fourth years ($P < 0.01$) as shown in (Figure 1). Statistically significant moderate positive correlation was found between academic and practical (operative dentistry and fixed prosthodontics) courses for fifth year ($P < 0.01$) as shown in (Figure 2). Statistically significant weak positive correlation was found between third and fifth years practical courses ($P < 0.01$). Statistically significant moderate positive correlations were found between third and fourth years practical courses, and between fourth and fifth practical courses ($P < 0.01$) as shown in (Figures 3,4).

Discussion

In Dentistry the acquisition of psychomotor skills and manual dexterity aptitude are highly important[13]. The aim of the present study was to investigate whether there is a correlation between the academic grades of dental

students and their practical performance during their preclinical/clinical courses in operative dentistry and fixed prosthodontics. The results of our study showed that dental students' academic grades correlated positively (weak to moderate correlations) with their preclinical/clinical grades.

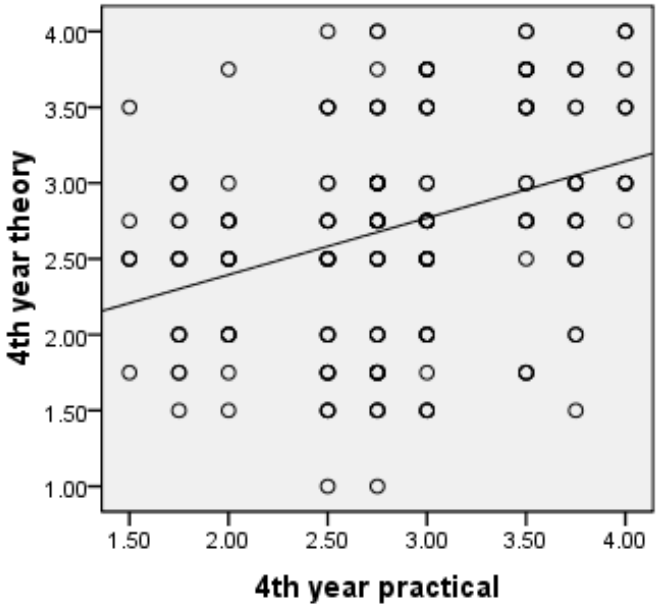

Figure 1: Scatter plot showing a significant positive correlation between 4th year theory and practical operative dentistry courses

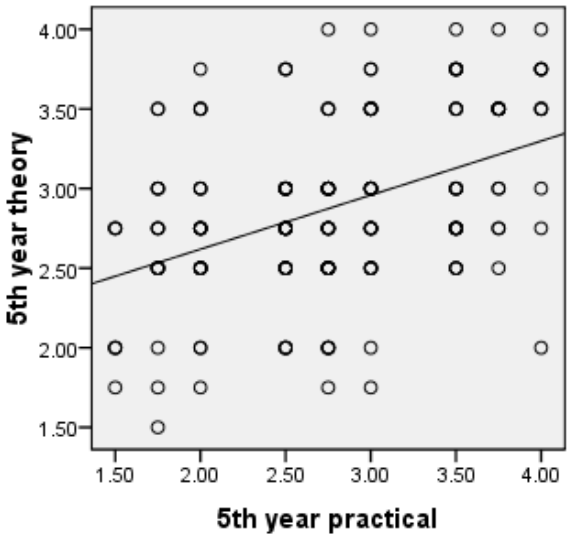

Figure 2: Scatter plot showing a significant positive correlation between 5th year theory and practical operative dentistry courses

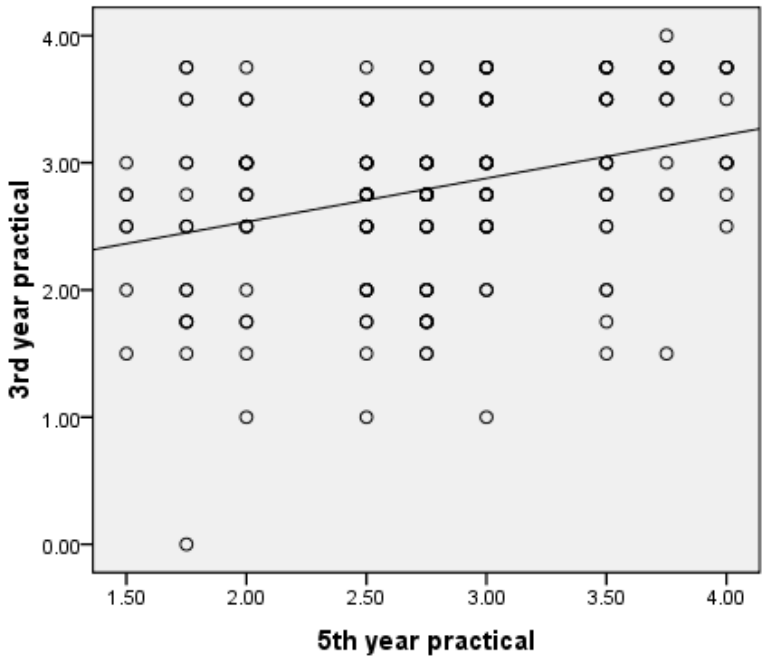

Figure 3: Scatter plot showing a significant positive correlation between 3rd year and 5th year practical operative dentistry courses

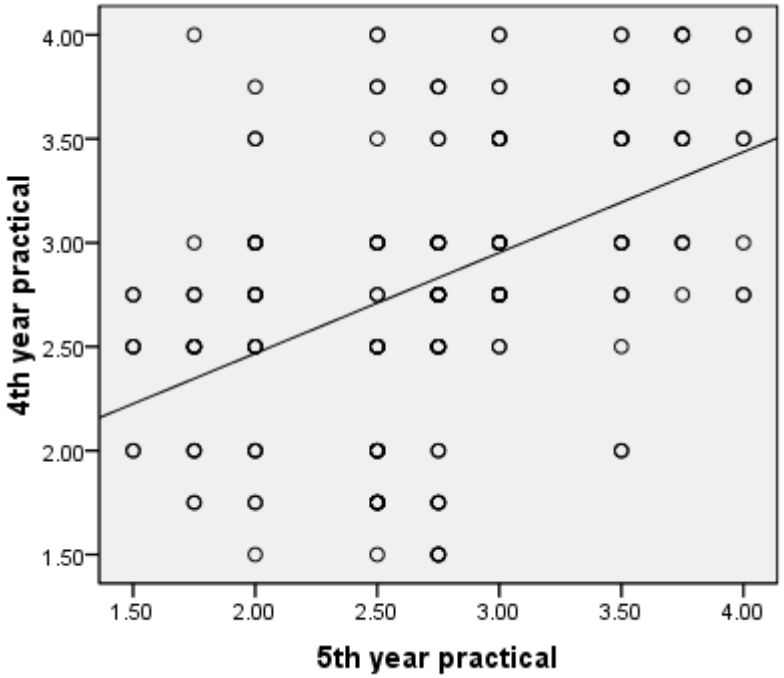

Figure 4: Scatter plot showing a significant positive correlation between 4th year and 5th year practical operative dentistry courses

In our study weak positive correlations were found between academic and practical grades for third and fourth years. It improved to be moderately significant positive in fifth year. This low strength of positive correlation between academic and practical grades in third, fourth, and fifth years indicates that performance of students in technical dental procedures cannot be predicted solely by their achievements in academic courses. Theoretical knowledge can help students in better achievement in practical and clinical sessions but other factors, such as manual dexterity, play a role and are trainable in the course of dental education, which is in agreement with Lundergan and Lyon study[11]. The latter study suggested that the complex nature of modern dental practice requires a broad range of skills that digital dexterity contributes only a small increment[11].

Our findings are consistent also with the data of Zawawi et al. who investigated four courses (Dental Anatomy, Prosthodontics, Operative Dentistry, and Orthodontics), although the positive correlations in the latter study were course specific[12]. Affifi et al. study showed different results in which no correlation between the academic and the practical grades for the three courses (Dental Anatomy, Removable Prosthodontic Denture, Orthodontics) they used in their study[2]. These differences may be due to the small sample size in the previous study (86 students) compared to the current one (194 students).

The data obtained in the present study confirm Giuliani et al. conclusion; manual ability is not only a matter of ‘hand’, but also of ‘head’ and that manual performance is supported by the capacity to plan, organize, analyze and verify[14]. Giuliani et al., reported that basic manual dexterity is not essential in the selection of dental students, because these skills can be improved through incremental learning and extra practice[14]. The weak correlations between the academic and the practical grades in third, fourth, and fifth year did support those results.

Yet, we cannot claim that all students at the beginning of their journey of dental education start equally at novice level as stated by Chambers and Geissberger[15], as no assessment to students was performed on admission. The significant positive correlations between the three practical courses in third, fourth, and fifth year although weak to moderate correlations contradict such a statement. Again these findings are not surprising to us sense we as instructors observe such differences in manual dexterity aptitude between students that have an effect on student's assessment. Therefore, we think that although some students may have some sort of genuine artistic skills and innate aptitudes, most dental practical procedures and motor skill sets are teachable and can be acquired.

The mean of the fifth year practical grades were marginally less than the mean of third and fourth years' practical grades (table 1). In our opinion this result may be attributed to the more difficult and complicated operative procedures required from the students. Students are required in their graduating fifth year to finish comprehensive cases with crowns and bridges, posts and cores, together with dental restorations on patients. On the other hand, fourth year students concentrate on simple operative procedures such as dental restorations without posts and cores, nor molar crown preparations. Moreover third and fourth years' preclinical practical grades are achieved

from students' performance on typodont-mounted manikins. Operating on living patients definitely encounters more difficulties.

Our correlations and its degree indicate that achievement of students in practical dental courses could be partly influenced by their grades in theoretical courses and that their achievement in clinical courses could be partly predicted by their grades in preclinical practical courses. However, other confounding factors such as genuine artistic skills of students, factors related to supervisors of clinical sessions, patients' factors, and degree of student to cope with stress of practical or clinical sessions are additional factors that should be considered.

The results of the present study rejected the first null hypothesis; were there is significant positive correlation between third/fourth/fifth year dental students' academic grades and their practical preclinical/clinical grades of the same course. The second null hypothesis was rejected too; there is correlation between third/fourth year dental students' practical preclinical grades and their practical clinical grades in fifth year.

Conclusion

The present study demonstrated significant but weak positive correlation between dental students' academic and practical grades and practical grades in different study years. These results suggest that fine manual skills are teachable and can be acquired. On the other hand, admission procedures for dental schools could include theoretical and practical components to evaluate the manual aptitude for the applicants. Moreover, other confounding factors related to the student, patient, and instructor have to be considered when studying correlations between students' academic and practical grades, as those variables may help in explaining the variance of the students' practical grades.

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العلاقة بين التحصيل الأكاديمي النظري والتحصيل العملي لمجموعة من طلاب كلية طب الأسنان في الجامعة الأردنية

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الملخص

الأهداف: يعتمد القبول في كلية طب الأسنان في الجامعة الأردنية على تحصيل الطالب النظري في المدرسة، وهذه الدراسة تهدف إلى دراسة العلاقة بين تحصيل الطالب النظري وتحصيله وأدائه العملي خلال سنوات دراسته الجامعية، بالإضافة إلى البحث في وجود علاقة بين تحصيل الطالب في المختبرات ما قبل الأداء العملي على المرضى، وأدائه العملي على المرضى في السنوات اللاحقة.

الطريقة: تم جمع درجات الطلاب الذين تخرجوا من كلية طب الأسنان الجامعة الأردنية للعامين 202014 و2015، خلال سنواتهم الدراسية الثالثة والرابعة والخامسة، في مادتي المعالجة التحفظية والتركيبات السنية الثابتة، سواء درجاتهم النظرية وكذلك درجاتهم العملية. تم عمل دراسة مقارنة للتحصيل النظري والتحصيل العملي بناء على تلك الدرجات لكل عام على حدة، للسنة الثالثة والرابعة والخامسة، وتم مقارنة التحصيل العملي للأعوام الثلاثة بناء على تلك الدرجات.

النتائج: أظهرت النتائج وجود علاقة إحصائية ضعيفة إلى متوسطة بين التحصيل الأكاديمي النظري للطالب وتحصيله العملي لنفس العام، وكذلك وجود علاقة إحصائية ضعيفة إلى متوسطة بين التحصيل العملي للطالب في المختبرات ما قبل الأداء العملي على المرضى وتحصيله العملي على المرضى في السنوات اللاحقة خلال السنوات الثلاثة.

الخلاصة: قوة العلاقات الإحصائية ودرجاتها والتي تم التوصل إليها خلال هذه الدراسة تشير إلى أن تحصيل الطالب وأدائه العملي يمكن له أن يُفسر جزئيا من خلال تحصيله النظري ودرجاته النظرية، كما أن تحصيل الطالب في المختبرات ما قبل الأداء العملي على المرضى يمكن له أن يتنبأ جزئيا بتحصيله العملي على المرضى في السنوات اللاحقة. نتائج الدراسة تقود إلى استنتاج إمكانية وجود عوامل مؤثرة أخرى تؤثر في تحصيل الطالب وأدائه العملي بالإضافة إلى تحصيله النظري مثل، مهاراته الفنية الأصيلة، عوامل متعلقة بالمشرف أو متعلقة بالمريض نفسه، وقدرة الطالب على العمل تحت الضغوط وفي بيئة ضاغطة وعوامل مختلفة أخرى.

الكلمات الدالة: التحصيل الأكاديمي، التحصيل العملي، طلاب طب الأسنان.