

Dental students' self-perception on basic pharmacology at a Brazilian university


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Abstract The discipline of pharmacology offers knowledge in order to understand the principles of drug therapy and it is extremely important for dental training. However, factors such as lack of integration between basic and applied knowledge result in demotivation and low performance of students. The objective of this study was to build, validate and apply a questionnaire aimed at undergraduate dental students who attended the discipline of pharmacology to assess self-perception concerning satisfaction, motivation and level of learning. A three-domain questionnaire approaching satisfaction, motivation, and learning was developed, which underwent content and construct validity. One hundred and sixty-five dental students at the University of Brasília answered the questionnaire. The majority belonged to the female gender (67.3%), 45% were admitted through the traditional entrance exam, 63.3% were not quota holders and 52.1% pointed out that dentistry was not their first option of higher education. The average level of satisfaction regarding the discipline of pharmacology was 67.6%, and the level of motivation was 75.7%. The average score attributed to the learning domain was 8.3. Most students reported an average level of satisfaction. The level of motivation was identified as medium by half of the students, and high by the other half. The learning level was high. Satisfaction, motivation and learning were not associated with gender, admission to the institution of higher education, being a quota holder, having chosen dentistry as a first option of higher education and current semester in the course.

Descriptors: Pharmacology. Motivation. Students, Dental.

Autopercepción de estudiantes de Odontología sobre farmacología básica en una Universidad Brasileña

Resumen La disciplina de farmacología ofrece conocimientos para la comprensión de los principios de la terapia medicamentosa y es de extrema importancia para la formación odontológica. Sin embargo, factores como la falta de integración entre el conocimiento básico y el aplicado resultan en desmotivación y bajo rendimiento de los estudiantes. El objetivo de este estudio fue construir, validar y aplicar un cuestionario dirigido a estudiantes de pregrado en Odontología que cursaban la disciplina de farmacología para evaluar la autopercepción en cuanto a la satisfacción, motivación y nivel de aprendizaje. Se desarrolló un cuestionario con tres dominios que abordan satisfacción, motivación y aprendizaje, el cual pasó por validación de contenido y constructo. Ciento sesenta y cinco estudiantes de Odontología de la Universidad de Brasília respondieron al cuestionario. La mayoría pertenecía al género femenino (67,3%), el 45% fueron admitidos por el examen de admisión tradicional, el 63,3% no eran beneficiarios de cuotas y el 52,1% señaló que Odontología no fue su primera opción de educación superior. El nivel medio de satisfacción con respecto a la disciplina de farmacología fue del 67,6% y el nivel de motivación fue del 75,7%. La calificación media asignada al dominio de aprendizaje fue de 8,3. La mayoría de los estudiantes informó un nivel medio de satisfacción. El nivel de motivación fue identificado como medio por la mitad de los estudiantes y alto por la otra mitad. El nivel de aprendizaje fue alto. La satisfacción, motivación y aprendizaje no estuvieron asociadas con el género, el ingreso a la institución de educación superior, el hecho de ser beneficiario de cuotas, haber elegido Odontología como primera opción de educación superior ni con el semestre en curso en la carrera.

Descriptores: Farmacología. Motivación. Estudiantes de Odontología.

Autopercepção de estudantes de Odontologia sobre farmacologia básica em uma Universidade Brasileira



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Resumo A disciplina de farmacologia oferece conhecimentos para a compreensão dos princípios da terapia medicamentosa e é de extrema importância para a formação odontológica. Porém, fatores como a falta de integração entre o conhecimento básico e o aplicado resultam na desmotivação e no baixo desempenho dos alunos. O objetivo deste estudo foi construir, validar e aplicar um questionário direcionado a estudantes de graduação em Odontologia que cursavam a disciplina de farmacologia para avaliar a autopercepção quanto à satisfação, motivação e nível de aprendizagem. Foi desenvolvido um questionário com três domínios abordando satisfação, motivação e aprendizagem, que passou por validação de conteúdo e de constructo. Cento e sessenta e cinco estudantes de Odontologia da Universidade de Brasília responderam ao questionário. A maioria pertencia ao gênero feminino (67,3%), 45% foram admitidos pelo vestibular tradicional, 63,3% não eram cotistas e 52,1% apontaram que a Odontologia não foi sua primeira opção de ensino superior. O nível médio de satisfação em relação à disciplina de farmacologia foi de 67,6% e o nível de motivação foi de 75,7%. A nota média atribuída ao domínio aprendizagem foi 8,3. A maioria dos estudantes relatou um nível médio de satisfação. O nível de motivação foi identificado como médio por metade dos alunos e alto pela outra metade. O nível de aprendizagem foi alto. A satisfação, a motivação e a aprendizagem não estiveram associadas ao gênero, ao ingresso na instituição de ensino superior, ser cotista, ter escolhido a Odontologia como primeira opção de ensino superior e semestre em curso no curso.

Descritores: Farmacologia. Motivação. Estudantes de Odontologia.

INTRODUCTION

Dentists are legally prescribers of drugs, and they also use drugs directly in patients in their area of expertise. Thus, during the training process, it is essential to acquire knowledge and training in drug therapy, whose foundation is basic pharmacology¹. In general, the discipline of basic pharmacology is offered in the initial stages of the course, when the undergraduate student does not have experience with patients yet. Therefore, it is highly desirable that teachers show the importance of the knowledge acquired in the basic sciences on practical applicability². However, persistent problems, such as the lack of an integrative view of both basic and clinical content and the lack of awareness about the practical applicability of the content, may cause dissatisfaction and demotivation for the study³. Thus, weaknesses regarding the understanding of basic pharmacology content are reflected in difficulties related to the handling and to the prescription of medications and are often perceived only in later steps of the course or after its completion^{4,5}. Consequently, the prescriber training deficit is one of the factors associated with the irrational use of medication, and it directly impacts health service users since it increases the risk of morbidity and mortality due to adverse effects, drug interactions, among others issues¹.

Motivation and student satisfaction are two essential domains involved in the learning process and are interrelated. These domains, when positive, determine the student's deepening of the study, conceptual learning and stimulate creativity³. Thus, the knowledge of perception, motivation and satisfaction related to basic pharmacology from students' own view can help the search for solutions to the difficulties presented, assisting curricular reorientation, the incorporation of contemporary teaching approaches and the prioritization of essential contents. Given the above, the objective of our study was to construct and validate a questionnaire aimed at undergraduate dental students, in order to know their self-perception regarding satisfaction and motivation as well as evaluate the learning on the discipline of basic pharmacology.

METHODS

This is a cross-sectional study, consisting of 2 steps. The first moment consists of the construction and validation of a questionnaire (Step 1) and the second one of its application to undergraduate dental students at the University of Brasília (UnB), Brasília, Brazil (Step 2). The study was approved by the institutional Research Ethics Committee (opinion number 3,123,829; CAAE 02797218.7.0000.0030).

Step 1 - Elaboration, construction and validation of the questionnaire

Initially, ten students from the dentistry course at the UnB were randomly chosen and interviewed; the collected data subsidized the construction of the questionnaire. The initial version of the questionnaire had 31 questions divided into three domains: A) Satisfaction, B) Motivation and C) Learning; in addition to questions about the students' socio-demographic

profile.

Five university professors in the health field were invited to participate as judges of the questionnaire's content validation process and they all accepted it. The judges rated the questions as relevant or not relevant and were able to add comments and suggestions. The Content Validity Index (CVI)⁶ was calculated for each question. The questions with CVI equal to 100% were maintained, those with CVI between 80% and 100% were rewritten and those with CVI lower than 80% were removed from the questionnaire.

Construct validity was performed by confirmatory factor analysis and, for this purpose, Stata version 16 statistical software was used. Confirmatory factor analysis was used to create the satisfaction and motivation domains as latent variables. Then, these latent variables were compared according to the socio-demographic variables.

Step 2 - Application of the questionnaire

UnB offers thirty positions for the dentistry course every six months, and the whole course has a total of ten academic semesters. In the second step of the study, students from the fourth to the tenth semester were invited to participate, totaling 166 active and enrolled participants. The inclusion criteria included being a dental undergraduate student at the UnB and having attended the pharmacology course at the institution. The exclusion criterion was having studied pharmacology at a higher education institution other than UnB, even though the credits had been used.

A trained person applied the questionnaire in the classroom and clarified all the doubts of the participants. The students who agreed to participate in the research signed the Informed Consent Form. The questionnaire was completed on paper, in ink, without any identification of the respondent, and the maximum application time was 20 minutes. Participants could have chosen not to answer all the questions. The answers to the questions belonging to domains A and B were presented using a Likert scale⁷, ranging from 1 (lowest score) to 5 points (highest score), such as "Not Satisfied" to "Totally Satisfied" and from "Not Motivated" to "Totally Motivated". In domain C, participants assessed statements on basic pharmacology topics and judged them to be true or false. Subsequently, the judgment made by the participants was classified as correct or incorrect.

Statistical analysis

The data on the socio-demographic profile of the participants and of the 3 domains (A, B and C) were presented as descriptive statistics. For the analysis of the answers related to domains A, B and C, only the complete questionnaires for each domain were computed.

Considering the lowest score of each question equal to 1 point and the maximum to 5 points, the sum of the answers for each domain was calculated regarding the number of questions for each of them. Thus, for domain A, which contained 10 questions, the sum of the answers varied between 10 and 50 points. For domain B, which contained 7 questions, the sum of the answers varied between 7 and 35 points. Subsequently, satisfaction and motivation indexes in percentage (%) were calculated as well as categorized on three-level scales (low, medium and high). The level scales were classified according to quartiles: low (values below the first quartile), medium (values between the first and third quartiles) and high (values above the third quartile). For domain C, 1 point was assigned for each correct answer and no point for each incorrect answer, with the maximum sum equal to 10 points.

Each domain was compared according to the following variables: gender, admission, type of admission (quota holder), dentistry as first option and position in the current semester. A comparison between satisfaction and motivation was done using Fisher's test, and the estimated odds ratio (OR) was calculated using the Baptist-Pike method. Also, learning skill was compared using the Mann-Whitney test for two categories and the Kruskal-Wallis test for three or more categories. All analyses were performed using the significance level of 5% and the statistical software STATA version 16.

RESULTS

Step 1

Out of the 31 questions, 15 presented CVI equal to 100% and were maintained; 12 presented CVI equals to 80% and underwent minor reformulations and 4 were excluded for presenting CVI below 80%. Therefore, the final version of the questionnaire resulted in 27 questions; 10 belonging to domain A, 7 belonging to domain B and 10 belonging to domain C.

The confirmatory factor load of the questions belonging to domains A and B are shown in Table 1. The factor analysis showed

a Kaiser-Meyer-Olkin measure of adequacy for the sample of 0.717 ($p < 0.0005$). Question 8 of domain A and question 2 of domain B obtained a factor load less than 0.3. These questions remained in the questionnaire in spite of the result because the construct analysis was carried out throughout confirmatory factor analysis after the construction of the final version of the questionnaire.

Table 1. Estimates of the factor load of the model adjusted by domains A (satisfaction) and B (motivation).

Question	Domain A	Domain B
1	1.23	0.43
2	0.62	0.21
3	1.16	0.56
4	0.61	0.80
5	0.41	0.82
6	0.52	0.46
7	0.75	0.73
8	0.20	-
9	0.38	-
10	0.41	-

Step 2

In total, 165 undergraduate dental students, who took the discipline of pharmacology at UnB, were interviewed, thus 99.4% of eligible participants were interviewed. The interviews were carried out between May and July 2019. The characteristics of the interviewed students in relation to gender and school profile are summarized in Table 2. Most students are female, are not quota holders, and pointed out that dentistry was not their first choice as a course. Medicine was the most mentioned course as students' first choice.

Table 2. Characteristics of the students interviewed from the 4th to the 10th semesters of the dentistry course at UnB. Absolute (n) and relative (%) distribution (n = 165).

Variables	n	%
Total	165	100.0
<i>Gender</i>		
Male	50	30.3
Female	111	67.3
Not informed	4	2.4
<i>Admission</i>		
Traditional Entrance Exam	75	45.5
ENEM ^a	22	13.3
PAS ^b	53	32.1
Other	15	9.1
<i>Quota holder</i>		
Yes	58	35.2
No	105	63.6
Not informed	2	1.2
<i>Dentistry as first option</i>		
Yes	79	47.9
No	86	52.1
<i>Semester</i>		
4 th to 6 th	61	37.0
7 th to 10 th	102	61.8
Not informed	2	1.2

^a National Exam of Secondary Education. ^b Serial Assessment Program

Initially, in order to assess the three domains, 32 questionnaires were excluded because they were not completely filled out, accounting for a total of 133 questionnaires analyzed. The average level of satisfaction, motivation and learning was 67.6%, 75.7% and 82.8%, respectively. In a second analysis, all the questionnaires completely filled out for each variable were computed according to the assessed domain. Most respondents indicated an average level of satisfaction in relation to the discipline of pharmacology. Half of the students indicated an average level of motivation in relation to it, while the other half indicated a high level. Most students showed a high level of learning (Figure 1).

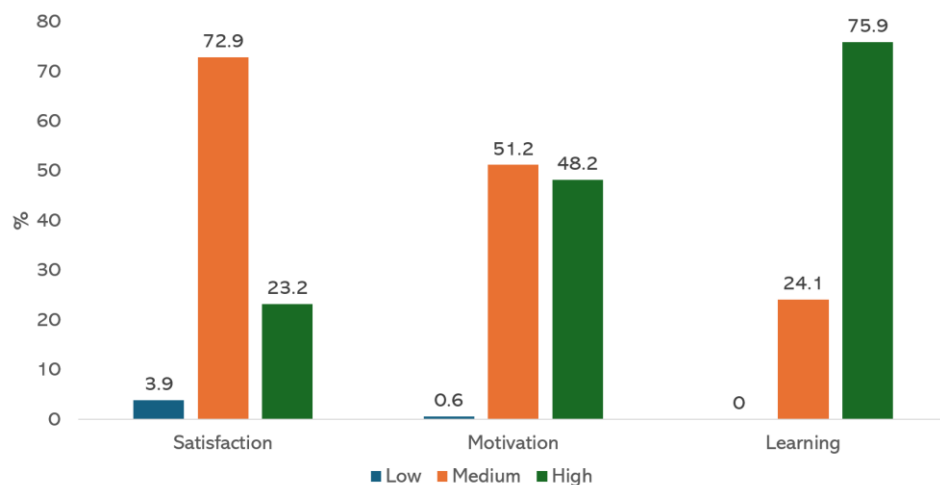


Figure 1. Relative distribution (%) of the participants' answers regarding the self-perception on the level of the evaluated domains.

Regarding satisfaction, most students classified it as average, with no significant difference regarding gender (p -value = 0.3), admission through ENEM, PAS, or others (p -value = 0.38; 0.67 and 0.72 respectively), being a quota holder (p -value = 0.69), dentistry course as the first option of higher education (p -value = 0.45) or current semester (p -value = 0.85) (Table 3). As for the satisfaction domain, the average score for question 3 ("resources used outside class") was significantly lower in relation to the other questions ($p < 0.0001$).

Table 3. Absolute distribution and percentage of students in the dentistry course at UnB, according to the level of satisfaction in relation to the discipline of pharmacology according to the variables studied ($n = 155$).

Variables	Low + Medium		High		p-value ¹	OR (CI95%) ²
	n	%	n	%		
<i>Gender (n= 152)</i>						
Male	31	70.5	23	21.3	0.3	1,55 (0.69 - 3.45)
Female	85	73.3	13	29.6		
<i>Admission (n=155)</i>						
Traditional entrance exam	54	76.1	17	23.9	0.38 0.67 0.72	0,50 (0.14- 1.76) 1.23 (0.54 – 2.73) 0,63 (0,13-2,85)
ENEM	19	86.4	3	13.6		
PAS	36	72.0	14	28.0		
Other	10	83.3	2	16.7		
<i>Quota holders (n=153)</i>						
Yes	42	79.2	11	20.8	0.69	1,21 (0,54 - 2,58)
No	76	76.0	24	24.0		
<i>Dentistry as first option (n=155)</i>						
Yes	54	73.9	19	26.0	0.45	0,74 (0,35 - 1,54)
No	65	79.3	17	20.7		
<i>Semester(n=154)</i>						
4 th to 6 th	46	77.9	13	22.0	0.85	1,13 (0.53 - 2.43)
7 th to 10 th	72	75.8	23	24.2		

OR: odds ratio. CI: confidence interval. ¹Fisher's test. ²Estimated Baptista-Pike OR. *Satisfaction classified according to quartiles: low (until the 1st

quartile), medium (between the 1st and the 3rd quartile) and high (above the 3rd quartile). Low and medium satisfaction were grouped.

Concerning motivation, half of the students classified it as average and half as high. Motivation was high for non-quota students and for those who entered the institution through the traditional entrance exam. There were no significant differences for variables such as gender (p -value = 0.99), dentistry as first option (p -value = 0.64), admission through ENEM, PAS, or others (p -value = 0.62; 0.11 and 0.58 respectively), being a quota holder (p -value = 0.14), and current semester (p -value = 0.87) (Table 4). In the motivation domain, the average score for question 3 ("studying beyond the content taught in the classroom") was significantly lower than the score in relation to the score of other questions ($p < 0.0001$).

The score for the learning domain was calculated continuously (percentage of correct answers), and it is shown in Table 5. It can be seen that the average score was 82.8%, with a minimum value of 40% and a maximum of 100%. The comparison of the correct percentage of correct answers, according to the characteristics of the students was not statistically significant for gender (p -value = 0.67), admission (p -value = 0.66), quota holder (p -value = 0.91), dentistry as first option (p -value = 0.19), current semester (p -value = 0.96). As for the learning domain, the average score of questions 4 ("non-opioid analgesics are the last choice for treating mild pain due to the severity of their adverse effects") and 9 ("first-pass effect does not occur when the drug is administered orally") were significantly lower in relation to the scores of the other questions ($p < 0.0001$).

Table 4. Absolute distribution and percentage of students in the dentistry course at UnB, according to the level of motivation in relation to the discipline of pharmacology according to the variables studied ($n = 164$).

Variables	Low + Medium		High		p-value ¹	OR (CI95%) ²
	n	%	n	%		
<i>Gender</i> (n=160)						
Male	58	52.3	24	49.0	0.99	1.05 (0.55 - 2.02)
Female	25	51.0	53	47.8		
<i>Admission</i> (n=164)						
Traditional entrance exam	34	45.3	41	54.7	0.62	0.75 (0.30 - 2.06)
ENEM ^a	11	52.4	10	47.6		
PAS ^b	32	60.4	21	39.6	0.11	0.54 (0.27 - 1.11)
Other	8	53.3	7	46.7	0.58	0.73 (0.26 - 2.21)
<i>Quota holders</i> (n=162)						
Yes	35	60.3	23	39.7	0.14	1.64 (0.86 - 3.08)
No	50	48.1	54	51.9		
<i>Dentistry as first option</i> (n=164)						
Yes	39	48.4	40	50.6	0.64	0.83 (0.46 -1.56)
No	46	54.1	39	45.9		
<i>Semester</i> (n=162)						
4 th to 6 th	31	50.8	30	49.2	0.87	0.94 (0.50 - 1.77)
7 th to 10 th	53	52.5	48	47.5		

OR: odds ratio. CI: confidence interval. ¹Fisher's test. ²Estimated Baptista-Pike OR. *Motivation classified according to quartiles: low (until the 1st quartile), medium (between the 1st and the 3rd quartile) and high (above the 3rd quartile). Low and medium motivation were grouped.

DISCUSSION

This study highlights a critical gap in pharmacology education within a Brazilian dental course; *half of the students indicated their satisfaction and motivation levels as a medium*. We hypothesize that in basic pharmacology, students have difficulties understanding the applicability of the knowledge transmitted, which generates incomplete satisfaction and, consequently, motivation. Despite its importance as a fundamental science, pharmacology often takes a backseat to drug therapy instruction, leading to an insufficient understanding of essential pharmacological principles among dental students. By identifying these educational shortcomings and proposing improvements, our research advances the discourse on enhancing pharmacology education in dental training, aiming to better equip future dental professionals for contemporary healthcare challenges. One possible solution is to teach classes contextualized to the dental clinic to increase student motivation, and the students will be more satisfied. In public and private schools, this strategy can be

implemented in various disciplines and basic content, such as biochemistry, immunology, physiology, and anatomy. To this end, a change in teaching philosophy and teachers' qualifications and training is necessary to incorporate meaningful learning.

Table 5. Distribution of the level of learning in relation to the discipline of pharmacology among students of the dentistry course at UnB according to the variables studied (n = 141).

Variables	Average	Median	SD	Minimum	Maximum	IQR	p-value
<i>Gender</i>							
Male	83.7	90.0	12.8	40.0	100.0	20.0	0.67 ¹
Female	82.2	80.0	13.8	40.0	100.0	10.0	
<i>Admission</i>							
Traditional entrance exam	82.2	80.0	13.2	40.0	100.0	10.0	0.66 ²
ENEM	81.4	90.0	13.6	40.0	100.0	20.0	
PAS	84.7	80.0	12.5	50.0	100.0	20.0	
Other	79.2	80.0	14.4	50.0	100.0	20.0	
<i>Quota Holders</i>							
Yes	82.9	80.0	12.5	50.0	100.0	10.0	0.91 ¹
No	82.4	80.0	14.0	40.0	100.0	20.0	
<i>Dentistry as first option</i>							
Yes	84.7	90.0	12.0	60.0	100.0	10.0	0.19 ¹
No	80.9	80.0	14.3	40.0	100.0	20.0	
<i>Semester</i>							
4th to 6th	82.6	80.0	13.7	50.0	100.0	20.0	0.96 ¹
7th to 10th	82.6	80.0	13.3	40.0	100.0	10.0	
<i>Age</i>	-	-	-	-	-	-	0.08 ³

SD: standard deviation. IQR: interquartile range. ¹Mann-Whitney non-parametric test. ²Kruskal Wallis non-parametric test. ³Spearman's correlation coefficient.

Pharmacology teaching is present in a variety of courses in the health field, such as medicine, pharmacy, dentistry and nursing courses. Depending on the specific context, its aims and implementation vary substantially ². However, there is still a lack of knowledge about pharmacology as a basic science in the various courses in the health field ¹. One of the explanations for such phenomenon is that the teaching of pharmacology as a basic science has been replaced by the study of drug therapy, without the discussion of fundamental concepts of the first that directly impact on the second. The content of the basic pharmacology course is traditionally taught by means of pharmacokinetic and pharmacodynamic concepts, in addition to the study of drug classes in the context of disease pharmacotherapy. The acquisition of such knowledge must precede the teaching of drug therapy. In summary, there is no way to teach drug therapy while ignoring pharmacology as a basic science¹. The consequences of the lack of knowledge of the pharmacological basis extend to the clinic, bringing to light important problems related to the use of drugs due to the prescribers' lack of knowledge about their therapeutic and adverse effects¹. In view of the increasing longevity of the world population, the growing number of diabetic and hypertensive individuals, among other chronic diseases, polypharmacy, the introduction of the dental surgeon in the hospital environment; the teaching of pharmacology as a basic science to health courses should deserve special attention, which motivated the development of our study.

Initially, it was necessary to know the profile of the dental student at UnB, a public university located in the Central-West region of Brazil. The institution was created in 1962, has 4 campuses, 134 undergraduate courses, 39,699 undergraduate students, 8,819 graduate students, 2,890 teachers and 3,233 technical-administrative employees. The dentistry course was created in 1981, offers 30 positions each semester and has a total duration of 10 semesters (5 years)⁸. Pharmacology in the dentistry course is taught by the Pharmacy Department in the third semester of the course. Our study showed that most dental students are women, a fact that is repeated worldwide in several European countries such as Belgium, Denmark, Germany, Portugal, the Netherlands, Estonia, Finland, France, Hungary, among others, in addition to the countries of Latin America such as Brazil and Chile⁹. Brazilian social and racial inclusion policies expanded access to public higher education through Law 12711 of 2012¹⁰, the "Quota Law". Furthermore, access to Brazilian public universities occurs through several mechanisms, including the traditional entrance exam, the National Exam of Secondary Education (ENEM), and the PAS program (Serial Assessment Program - which applies tests at the end of each high school year). The majority of dental students obtained access to UnB through the traditional entrance exam,

and 35% were quota holders. A curious fact is that half of the students mentioned that dentistry was not their first option of higher education; in fact, medicine was the first option of the majority.

The average level of students' satisfaction in relation to the discipline of pharmacology in our study was 67.7%. The concept of satisfaction is, in general, defined as the personal perception of meeting the expectations generated in relation to some process or product¹¹. Regarding the education aspect, satisfaction measures the student's perception resulting from the educational experience, considering services and facilities¹¹. In view of the competition triggered by the large current offer of higher education courses by private, educational institutions, in addition to the public ones, and considering the student as a consumer of education, research on student satisfaction is increasingly frequent¹¹. Despite these facts, there is still difficulty in defining it properly and what the best method to measure it effectively may be, given the context experienced by the university in the modern consumerist era¹². Studies have shown that the degree of satisfaction is related to the quality of teaching and the reputation of the academic institution^{13,14}. Moreover, students who are more satisfied with their academic institution remain more loyal to it, for, after completing the undergraduate course, they tend to stay on to graduate courses¹³. These concepts are applicable not only to private institutions, but also to public institutions, which are funded with resources from the state. In our study, it was observed that the majority of students indicated the level of satisfaction as medium in relation to the course.

Motivation was also object of our study due to its fundamental importance in the teaching-learning process, being its main determinant¹⁵. The average level of motivation of students in relation to the discipline of pharmacology in our study was 75.7%. Motivation is the major area of interest in the health professional education field, as it is responsible for academic success and has as an outcome the well-being of patients helped by students³. Regarding educational aspect, motivation can be defined as a phenomenon originated from the student's perception of himself and the environment around him, which leads him to carry out educational activities, persevering and engaging with them, aiming to achieve learning¹⁵. Intrapersonal characteristics (age, gender, personality traits) and interpersonal characteristics, such as lifestyle, academic conditions, course stage (beginning or ending), autonomy and feedback teachers offer the students, are the determining factors of motivation for learning³. It is known that more motivated students diversify study strategies and are more persevering in case of difficulties or failures, reaching higher levels of performance when compared to non-motivated students¹⁵. The alignment of students' expectations to teaching projects, the explanation of the teaching material usefulness, the use of challenging activities, the narrowing between theory and practice, the use of methods that support students' perception of self-efficacy, the offer of positive feedback from teachers to students are some of the motivational strategies that teachers can use¹⁵. It was clear in our study that students are not motivated to study the content of the course other than the offered in the classroom. However, it was observed that the majority of students indicated the level of motivation in relation to the course as medium to high.

The learning in our study was measured by a method limited to the student's performance in the face of an objective test. Questions involving basic concepts in pharmacology were applied, which was more or less distant in time from the moment when the content of the course was taught in the classroom, depending on the semester in which the respondent was. Therefore, the assessment of content learning occurred with students who were at different stages in the course. The most reliable method would be to apply the questions before and after a class had been taught in order to assess the true level of learning according to the literature¹⁶. The average learning score of the total respondents who answered all questions was 8.3 (out of a total of 10 points). Most students had a high level of learning. However, not everybody responded to the assessment related to learning, which may have generated a bias in the result obtained since students who chose not to answer may have done so due to difficulties in content retention.

When the results of the levels of satisfaction, motivation and learning were stratified according to the variables studied (gender, admission to higher education, being a quota holder or not, dentistry having been the first option in the university entrance exam and the student's position in the semester), no significant differences were found between them. These findings indicate that there was no association between the variables surveyed with self-perception about the level of satisfaction and motivation with the course, in addition to the level of learning measured.

The literature presents a few studies about the performance of dental students in the discipline of basic pharmacology. A study carried out in Ireland¹⁷ compared the performance of dental students throughout the application of questionnaires with multiple choice answers and the use of PBL (Problem-Based Learning) on both basic and clinical pharmacology topics. The results showed no association between gender (female / male) and the type of course in the health area (dentistry, medicine, and pharmacy) on student performance. In this study, it was also evident that the student's performance, when assessed in terms of knowledge about clinical pharmacology, was directly proportional to that of basic pharmacology, that is, students who obtained better performance in basic pharmacology also performed better in

clinical pharmacology. And those who performed worse in clinical pharmacology were those who performed worse in basic pharmacology as well¹⁷.

According to psychology, the intrinsic curiosity of each individual is a key factor for the spontaneous exploration of knowledge and its learning, for promoting it in association with memory retention. The movement towards learning by an intrinsically motivated individual in the face of a challenge occurs due to a gain, a reward or a pressure suffered¹⁸. Challenges presented as clinical problems to be solved can be motivating teaching strategies since the usefulness of knowledge is an important factor.

The interrelation between the teaching of pharmacology as a basic science and clinical pharmacology is extremely important, however, without the intention of substituting one for the other. Since the beginning of the course, it is necessary for the student to understand the importance of learning basic pharmacology, and thus, the teacher must contribute to the student's motivation, showing through clinical contextualities the relevance of the study about the content. Therefore, it is expected that the student becomes motivated, improves his performance in terms of learning and, consequently, his level of satisfaction.

Among the limitations of the study, there is the question related to the difficulty of memory about the perception of students who were in more advanced stages of the course on issues related to the researched domains. Another limitation was the number of blank answers, which, although low, were found in all domains. Furthermore, the study was conducted in a course from a single institution, which may not represent the reality in other institutions of higher education.

CONCLUSION

Half of the students indicated their level of satisfaction as medium. The level of motivation was identified as medium by half the students and high by the other half. The learning level was considered high.

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