Research Doi: 10.25282/ted.1330258

The Attitudes of Medical School Students Towards Pharmacology Course: Scale Development and Implementation Study

Tıp Fakültesi Öğrencilerinin Farmakoloji Dersine Yönelik Tutumları: Ölçek Geliştirme ve Uygulama Çalışması

Ender Tekeş (ORCID: 0000-0001-5375-4621)

Çanakkale Onsekiz Mart University Faculty of Medicine, Çanakkale, TÜRKİYE

Corresponding Author: Ender TEKEŞ, E-Mail: endertekes@gmail.com

Abstract

Aim: In this study, it was aimed to develop a valid and reliable attitude scale by determining the attitudes of medical school students towards the pharmacology course and to examine these attitudes in terms of variables such as students' gender, year of education, reasons for choosing medical school, following sources other than lecture notes, and desire to specialize in medicine in the future.

Methods: In this research, which was conducted with the participation of 498 students, 250 female and 248 male, from the third, fourth, fifth and sixth terms of Canakkale Onsekiz Mart University Faculty of Medicine, a 21-item 5-point Likert-type scale was used as a data collection tool. The survey was carried out face to face with term 4, 5 and 6 students, and online with term 3 students. During the scale development phase, Kaiser-Meyer-Olkin test and Bartlett's Test of Sphericity were used, and factor analysis was performed with the Principal Axis Factoring (PAF) method. To identify factor candidates, the criterion was that the eigenvalue exceeded 1. To determine the reliability level, Cronbach Alpha and McDonald's Omega reliability levels were examined.

Results: The attitude scale of medical school students towards pharmacology course was developed as 12 items and two factors. Two factors with eigenvalues greater than 1 were determined in the scale: "indispensable course pharmacology" and "useless course pharmacology". It was determined that the Cronbach's alpha and McDonald's omega reliability values of the factors were above 0.70 and the scale was highly reliable. Although the students reached high mean and median values in the two negative items of the pharmacology attitude scale, they reached high mean and median values in the mostly positive items. In general, the students considered the pharmacology course necessary and exhibited positive attitudes. While the gender of the students did not make a difference in their attitudes towards the pharmacology course, the term of education and their reasons for choosing the medical school created a significant difference in their attitudes towards the pharmacology course. In addition, students' following medical sources other than lecture notes and resources provided by faculty members and their desire to be an expert created a significant difference in their attitudes towards the pharmacology course.

Keywords: Pharmacology, Attitude, Scale Development, Medical Education, Student

Anahtar Sözcükler: Farmakoloji, Tutum, Ölçek Geliştirme, Tıp Eğitimi, Öğrenci

Gönderilme Tarihi
Submitted: 20.07.2023
Kabul Tarihi
Accepted: 29.11.2023

To cite this article: Tekeş E. The Attitudes of Medical School Students Towards Pharmacology Course: Scale Development and Implementation Study. World of Medical Education. 2023;22(68):83-97

Conclusions: The results of this study show that the developed pharmacology attitude scale is a reliable and valid measure of students' attitudes towards the pharmacology course. These findings can be used to improve pharmacology teaching and encourage positive attitudes towards the course among medical students.

Özet

Amaç: *Bu araştırmada tıp fakültesi öğrencilerinin farmakoloji dersine yönelik tutumlarını belirleyerek geçerli ve güvenilir bir tutum ölçeği geliştirmek ve bu tutumları öğrencilerin cinsiyeti, öğrenim dönemi, tıp fakültesini seçme nedenleri, ders notu dışında kaynak takip etme, gelecekte tıpta uzmanlaşma isteği gibi değişkenler bakımından incelemek amaçlanmıştır.*

Yöntem: *Çanakkale Onsekiz Mart Üniversitesi Tıp Fakültesi üçüncü, dördüncü, beşinci ve altıncı dönemlerden toplam 250 kadın ve 248 erkek olmak üzere 498 öğrencinin katılımı ile yürütülen bu araştırmada veri toplama aracı olarak 21 maddelik 5 dereceli Likert tipi bir ölçek kullanılmıştır. Uygulama dönem 4, 5 ve 6 öğrencileriyle yüz yüze, dönem 3 öğrencileriyle ise çevrimiçi olarak yapılmıştır. Ölçek geliştirme aşamasında Kaiser-Meyer-Olkin testi, Bartlett's Test of Sphericity kullanılmış, Principal Axis Factoring (PAF) yöntemi ile faktör analizi gerçekleştirilmiştir. Faktör adaylarının belirlenmesi için özdeğerin 1'i aşması kriteri aranmıştır. Güvenirlik düzeyi belirlemek için Cronbach Alpha ve McDonald's Omega güvenirlik düzeyleri incelenmiştir.*

Bulgular: *Tıp fakültesi öğrencilerinin farmakoloji dersine yönelik tutum ölçeği 12 madde iki faktör olarak geliştirilmiştir. Ölçekte "vazgeçilmez ders farmakoloji" ve "işe yaramaz ders farmakoloji" olmak üzere öz değeri 1'den büyük iki faktör belirlenmiştir. Faktörlerin Cronbach alfa ve McDonald's omega güvenirlik değerleri 0,70 üzerinde olduğu ve ölçeğin yüksek düzeyde güvenilir olduğu tespit edilmiştir. Öğrenciler farmakoloji tutum ölçeğinin iki olumsuz maddesinde yüksek ortalama ve ortanca değere ulaşmış olmasına karşın daha çok olumlu anlamlı maddede yüksek ortalama ve ortanca değere ulaşmışlardır. Öğrenciler genel anlamda farmakoloji dersini gerekli görmüş ve olumlu tutum sergilemişlerdir. Öğrencilerin cinsiyeti farmakoloji dersine yönelik tutumda farklılık oluşturmazken, öğrenim gördüğü dönem ve tıp fakültesini seçme nedenleri, farmakoloji dersine yönelik tutumlarda anlamlı farklılık oluşturmuştur. Ayrıca öğrencilerin ders notları ile öğretim üyelerinin sağladığı kaynaklar dışında da tıp kaynağı takip etmesi ve uzman olmak isteğinin bulunması farmakoloji dersine yönelik tutumlarında anlamlı farklılık yaratmıştır.*

Sonuç: *Bu çalışmanın sonuçları, geliştirilen farmakoloji tutum ölçeğinin, öğrencilerin farmakoloji dersine yönelik tutumlarının güvenilir ve geçerli bir ölçüsü olduğunu göstermektedir. Bu bulgular farmakoloji öğretimini geliştirmek ve tıp öğrencileri arasında derse karşı olumlu tutumları teşvik etmek için kullanılabilir.*

INTRODUCTION

Pharmacology is the study of drugs and their effects on the body. It is a core component of medical education (1) because it provides healthcare professionals with the knowledge they need to prescribe and administer medications safely and effectively. Medications are a cornerstone of modern medicine and can be very effective when used correctly. On the other hand, they can also be dangerous if they are not used properly. Therefore, pharmacology is essential for physicians to practice medicine safely and effectively. Prescribing errors can cause serious harm such as disability, hospitalization, and death (2). Learning pharmacology is important for improving public health in terms of preventing medication-induced adverse events and drug-drug interactions (3). Although pharmacology education is an essential component of medical education, it is an intimidating course in medical education programs (4) because the sheer volume of information and complexity of pharmacology can be daunting. However, it is important to make connections between

molecular and cell biology, biochemistry, physiology, and clinical medicine to understand how drugs work. This will help learners to apply their knowledge in practice and make better decisions about drug therapy. Learning pharmacology is an important factor that affects the educational success of medical students, but the course is so difficult and complex and interconnected with other disciplines, which can lead to negative attitudes towards pharmacology course that can impact a student's educational success negatively.

The word "attitude" refers to an individual's relatively enduring orientation toward something, based on their beliefs and perceptions, which can be inferred from observed behavior and classified as affective, behavioral, or cognitive, and can be changed through learning (5). Attitudes play an important role in education. A positive attitude can help students to perform better in their academics as well as their day-to-day life. It can also be contagious and motivate the friends around them. A positive attitude can help students to succeed in various aspects of their lives and is important for mental health, because it helps students to be less stressed and more productive. It can motivate students to work hard and persevere not just in academics but in life as well. It can help students learn from their experiences, which can help them develop a positive self-image more confident in themselves. A positive attitude can inspire students and instill a positive attitude in them (5). Students who have a positive attitude towards school and learning are more likely to put in the effort and persevere in the face of challenges, which can lead to better academic outcomes. On the other hand, students who have a negative attitude towards school and learning are more likely to disengage from their studies, which can lead to lower achievement (6).

Attitudes are important because they are prevalent in human cognition. Furthermore, they can predict behavior. They can also influence perceptions and memories and establish several mental functions (7). In medicine, attitudes are crucial because they influence how doctors interact with patients and colleagues. The development of professional attitudes is influenced by a variety of factors, including personal experiences, role models, and the medical school environment. However, there is no single, agreed-upon method for teaching and assessing professional attitudes (8). Medical students should be encouraged to take ownership of their own clinical learning by adopting a variety of attitudes and behaviors that can enrich their educational experience, facilitate teaching from residents and faculty, and promote a positive learning environment (9).

Although there are studies on anatomy (10), embryology (11), pathology (12), psychiatry (13), nephrology (14) and neurology (15) courses that evaluate student attitudes in medical education, there is no study that develops an attitude scale in the field of pharmacology. In a limited number of studies related to the pharmacology course, attitude towards different evaluation methods (16), correlation between attendance of lectures and exam performance (17), and impact of team-based learning on student satisfaction and performance (18) were evaluated. In the literature, there is a study (19) on pharmacology that evaluates attitudes, but the study is not aimed at the pharmacology curriculum. It is a study that evaluates student feedback about rational prescribing education. There are also studies evaluating students' perspectives on pharmacology, but their focus is on teaching methods (20,21). A study found that fifth semester medical students had a neutral attitude towards pharmacology as a subject but preferred more clinical integration and problem-solving exercises. However, in the study, only positive items were used instead of positive and negative items to evaluate student attitudes, and it was not aimed to develop an attitude scale (22).

The branch of medical pharmacology

constitutes an important part of medical education. The success of modern medical education requires trained physicians to practice medicine blended with pharmacology knowledge. In this context, it is important to get an idea about students' approaches to this course. Identifying possible negative attitudes will provide an opportunity for decision makers to make the necessary arrangements for the pharmacology course. The aim of this study is to develop a valid and reliable measurement tool that can determine the attitudes of medical school students towards pharmacology course. This study also evaluates the attitudes of medical school students towards pharmacology course in terms of the variables of year of education, reasons for choosing medical school, and students' desire to specialize in medicine in the future. For this purpose, answers to the following questions are sought;

1.What is the validity and reliability level of the scale of attitude towards pharmacology?

2.Does students' attitudes towards pharmacology differ significantly according to;

•Gender,

•Year of education,

•The reason for choosing the medical school,

•Following sources other than lecture notes,

•Considering specialization in medicine.

METHODS

Participants

This research was carried out with the participation of students in the third, fourth, fifth, and sixth terms of the Faculty of Medicine at Canakkale Onsekiz Mart University. Term 1 and 2 students were not included in the study because there is no pharmacology course in these classes. Pharmacology courses start in term 3. It was thought that for the student's attitude towards the course to be determined realistically, he or she should have attended the course and had knowledge about pharmacology. The population of the research is the students in the third, fourth, fifth, and sixth terms of the Faculty of Medicine at Canakkale Onsekiz Mart University. The sample consisted of students who participated in the research on a voluntary basis. Data were obtained from a total of 498 students. This data file was used in three ways.

Exploratory Factor Analysis (EFA) Data File: This data file was created by randomly selecting 50% of the entire data file. As Hair et al. (23) stated, exploratory factor analysis (EFA) results should be validated in a split sample from the original data set or in a separate sample obtained through a new application. In accordance with this suggestion in the literature, EFA was performed on the randomly divided half of the data set.

Confirmatory Factor Analysis (CFA) Data File: This data file is the remaining half of the data file that was randomly split for EFA. Therefore, the CFA file was also created by the random selection method.

Comparison Analysis Data File: This data file contains all participants. Of the 498 participating students, 50.2% (n=250) were female and 49.8% (n=248) were male. 29.7% of the participants were term 3 (n=148), 24.5% were term 4 (n=122), 27.3% were term 5 (n=136), and 18.5% were term 6 students (n=92).

Data Collection Tool and Preparation

The data collection tool used in this study is the "Attitude Scale of Medical School Students Towards Pharmacology Course". The scale was made ready for application by following the steps below:

•It was decided to use a five-point Likert-type item (strongly disagree, disagree, partially agree, agree, and strongly agree), which was thought to be appropriate for the purpose of the scale. There are studies in the literature showing that the options of the 5-point Likert structure work well (24).

•In the literature review, the item structures of the scales developed for different courses in the field of medical education, pharmacology, and

pharmacology education literature were examined, and an item pool was created. There were 24 items in the item pool created using the literature.

•The created item pool was submitted to expert opinion, under the supervision of three academicians who are experts in the field of pharmacology, and two academicians who are experts in the field of measurement and evaluation. A form was created to obtain expert opinion on a table of items planned to be included in the draft scale. Experts rated each item as "Suitable", "Unsuitable", or "Requires replacement", and could also write change suggestions in a separate column.

•It was examined whether there was inter-rater reliability among the expert opinions received using Krippendorff's alpha coefficient. The obtained value of 0.83 indicated inter-rater reliability, so I made necessary adjustments based on expert opinions.

•There were 24 items in the item pool sent to the experts while receiving expert opinion. As a result of the feedback from experts, it was decided to remove 3 items from the scale draft form. In addition, the comprehension problem in two items identified by the experts was corrected, leaving 21 items in the final item pool.

•Necessary adjustments were made in the items in line with expert opinions, and the candidate scale form was created. The candidate scale, which was prepared to be developed, included 21 items with five graded response sets.

•To assess the understandability of the drafted scale, I conducted a pilot application with 20 medical school students. Students found the scale items to be understandable.

Survey

The surveys were carried out face-to-face with the students of term 4, 5, and 6. The survey for term 3 students was made online. After the earthquake that took place in Turkey on February 6, 2023, it was decided that practice classes should continue face-to-face education, while classes that do not offer practical lessons and teach more theoretical lessons should be taught online. For this reason, the term 3 survey was carried out online, and the term 4, 5, and 6 survey was carried out face-to-face. Before the survey, participants gave their consent that they participated voluntarily, and then the survey was carried out. All of the surveys were conducted in Turkish.

Analysis of Data

The data file properties were examined with the Kaiser-Meyer-Olkin test (KMO) and Bartlett's Test of Sphericity (23,25) in the analyzes performed for the scale development phase. Factor analysis was performed with the newly developed “Principal Axis Factoring (PAF)” method, which is suggested to be more suitable for scales whose theoretical background is not well known (26). The criterion of eigenvalue exceeding “1” was sought to determine the factor candidates. To determine the reliability level, Cronbach Alpha and McDonald's Omega reliability levels, which show reliability in terms of internal consistency, were examined. According to Nunnally and Bernstein (27), adequate reliability should be at least 0.70 and above. The results were analyzed according to this criterion. The fit of the model established in the confirmatory factor analysis was examined. Nonparametric methods, Mann Whitney U and Kruskal Wallis Test, were preferred in the comparison analyzes performed on attitudes towards the pharmacology course according to the variables. This is because the data did not show normal distribution, as determined by the Kolmogorov-Smirnov Normal Distribution Test performed on pharmacology attitude scale data.

Ethics Committee Approval

This research was carried out with the approval of the Scientific Research Ethics Committee of Canakkale Onsekiz Mart University, dated 16.02.2023 and numbered 02/09.

RESULTS

Validity and Reliability Level of Attitude Scale Towards Pharmacology Course

The suitability of the EFA file created by the random selection method from the entire data file to perform factor analysis was examined by the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity. The KMO value is 0.841 and the Bartlett's Test X2(66) = 1908 ($p<0.0001$) indicate that the data file is suitable for analysis (23,25). Factor analysis with the PAF method and factor rotation with the "Direct Oblimin" method were applied. Two factors with an eigenvalue greater than 1 were determined in the scale. In factor analysis, items 9, 10, 12, 15, 16, 17, 18, 20, and 21 with low correlation load (with a correlation value below 0.300) were removed from the scale. The remaining 12 items, the load values they show under two factors, the eigenvalues of the factors, the properties measured by the factors, and their reliability levels are given in Table 1.

Table 1. The Load Values of the Items Under the Factors, the Eigenvalues of the Factors, the Properties Measured by the Factors and Their Reliability Levels

	Factor		Eigenvalue	Cronbach Alpha	McDonald's Omega	Name of Factor
	1	2				
PA14. Learning about drugs and their mechanisms of action in pharmacology makes me feel like a doctor.	0.860					
PA8. Pharmacology provides a foundation for service delivery in all other fields of medical science.	0.829					
PA5. Learning pharmacology makes me happy.	0.811					
PA19. Pharmacology courses are interesting when taught as rational drug use.	0.734		4.352	0.901	0.903	Pharmacology as an Indispensable Course in Medical Education
PA13. Pharmacology knowledge should be refreshed at the beginning of each clinical internship.	0.707					
PA1. Pharmacology course is essential in medical education.	0.693					
PA4. A person who does not have a detailed knowledge of drugs and their mechanism of action cannot be a physician.	0.648					
PA11. I would not call a person who does not know pharmacology a physician.	0.610					

	Factor		Eigenvalue	Cronbach Alpha	McDonald's Omega	Name of Factor
	1	2				
PA2. Just hearing the name of the pharmacology drives me crazy.		0.948				
PA7. When the word "pharmacology" is mentioned, I get goosebumps.		0.862				
PA3. If I were the health minister, I would remove the pharmacology course from the curriculum of medical schools.		0.831	2.292	0.903	0.905	Pharmacology as a Useless Course
PA6. I would like to prevent the pharmacology course from being taught in its current form.		0.715				

The rmaining 12 items in the scale were grouped into two factors. The first factor (factor 1) consisted of eight attitude items that provided information about "Pharmacology as an indispensable course in medical education". All items were positive in nature. The minimum score that could be obtained from this factor was 8, and the maximum score was 40. A high score on this factor indicates an attitude that considers the pharmacology course to be important in medical education. The second factor (factor 2) consisted of four items that reflected an attitude that saw the "Pharmacology as a useless course". All items were negative in nature. The minimum score that could be obtained from this factor was 4, and the maximum score was 20. A high score on this factor indicates a negative attitude towards the pharmacology course, and also indicates an attitude that sees the pharmacology course as useless.

When using the scale developed by the researchers, if two total scores are to be obtained separately from the scale factors, there is no need to reverse-score the negative items. In this case, a high score on the first factor will indicate a positive attitude, while a high score on the second factor will indicate a negative attitude. However, a total score can also be obtained from all 12 items in the scale. In this case, in order for all items to have similar meaning loads, 4 items in the second factor should be reverse-scored and then the total score of 12 items should be obtained. In this case, a high score from the scale will indicate a positive attitude.

While th Cronbach's alpha reliability value of the first factor in the scale is 0.901, the reliability value of the second factor is 0.903. The Cronbach's alpha reliability value of the entire scale was calculated as 0.802. The McDonald's omega reliability value of the first factor is 0.903, while the reliability value of the second factor is 0.905. The McDonald's omega reliability value of the entire scale was calculated as 0.819. Adequate reliability should be at least 0.70 and above (27). In this case, it can be interpreted that the scale gave highly reliable results.

Confirmatory factor analysis (CFA) was performed on the CFA file created by the random selection / sampling method from the entire data file. The obtained CFA diagram is shown in Figure 1.

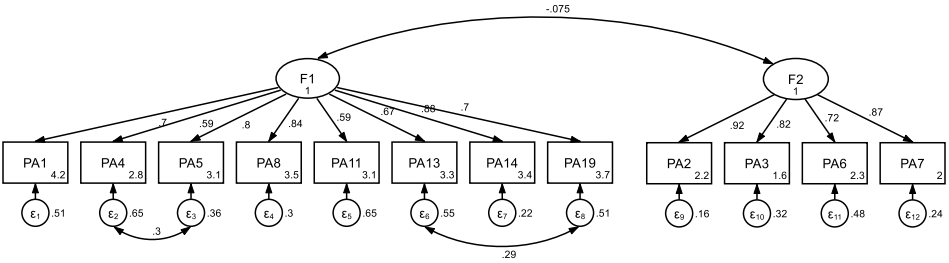

Figure 1. Confirmatory Factor Analysis Diagram of the Factor Structure of the Attitude Scale of Medical School Students Towards Pharmacology Course (Standardized Values Were Used)

It was determined that the correlation loads did not fall below 0.50 in any of the items under the factors in the diagram. The fit indices for the CFA model were calculated as RMSEA = 0.731, CFI = 0.941, and TLI = 0.924. These values correspond to acceptable fit values in the literature (23). Therefore, it can be concluded that the factor structure obtained was confirmed.

Investigation of the Attitudes of Medical School Students Towards Pharmacology Course

The attitudes of 498 students participating in the study towards pharmacology course are shown in Table 2.

Table 2. Attitudes of Medical School Students Towards Pharmacology Course

Items	Mean (Standard deviation)	Median (Min.-Max.)
Pharmacology course is essential in medical education.	4,12(0,9)	4(1-5)
Just hearing the name of the pharmacology drives me crazy.	3,33(1,2)	3(1-5)
If I were the health minister, I would remove the pharmacology course from the curriculum of medical schools.	3,88(1,3)	4(1-5)
A person who does not have a detailed knowledge of drugs and their mechanism of action cannot be a physician.	3,10(1,1)	3(1-5)
Learning pharmacology makes me happy.	3,41(1,1)	4(1-5)
I would like to prevent the pharmacology course from being taught in its current form.	3,25(1,2)	3(1-5)
When the word "pharmacology" is mentioned, I get goosebumps.	3,41(1,2)	4(1-5)
Pharmacology provides a foundation for service delivery in all other fields of medical science.	3,64(1)	4(1-5)
I would not call a person who does not know pharmacology a physician.	3,31(1,1)	3(1-5)
Pharmacology knowledge should be refreshed at the beginning of each clinical internship.	3,69(1,1)	4(1-5)
Learning about drugs and their mechanisms of action in pharmacology makes me feel like a doctor.	3,70(1,1)	4(1-5)
Pharmacology courses are interesting when taught as rational drug use.	3,86(1)	4(1-5)

N=498

When the items are examined, the items with the highest mean and median are as follows (in order of mean from largest to smallest):

•Pharmacology course is essential in medical education.
•If I were the health minister, I would remove the pharmacology course from the curriculum of medical schools.
•Pharmacology courses are interesting when taught as rational drug use.
•Learning about drugs and their mechanisms of action in pharmacology makes me feel like a doctor.
•Pharmacology knowledge should be refreshed at the beginning of each clinical internship.
•Pharmacology provides a foundation for service delivery in all other fields of medical science.
•Learning pharmacology makes me happy.
•When the word "pharmacology" is mentioned, I get goosebumps.

When these items were examined, it was understood that although the two negative items for pharmacology reached high mean and median values, most students reached high mean and median values for positive items. Medical faculty students generally considered the pharmacology course necessary and displayed a positive attitude.

The attitudes of the students towards the pharmacology course were also examined according to their gender, year of education (term), the reason for choosing the medical school, whether they followed the source other than the lecture notes, and whether they thought of specializing in medicine. The results are given in Table 3.

Table 3. Comparison of Students' Attitudes Towards Pharmacology Course (Mann Whitney U, Kruskal Wallis Test)*

Variable		N	Mean (St. Deviation)	Median (Min-Max)	Mann Whitney U (p)	Kruskal Wallis (p)	Significant Difference
Gender	Female	250	43,08(8,2)	41 (21-60)	29340 (0,300)	----	----
	Male	248	42,31(7,3)	40 (22-60)			
Term	Term 3	148	43,75(8,8)	41 (21-60)	----	7,887 (0,048)	Term 5 > Term 4 Term 5 > Term 6
	Term 4	122	42,09(7,8)	40 (22-58)			
	Term 5	136	43,29(6,8)	42 (26-57)			
	Term 6	92	40,93(6,9)	40 (28-60)			
The reason for choosing the medical school	My score is adequate.	62	40,77(7,4)	40 (22-57)	----	28,34 (<0,0001)	It's my ideal job > My score is adequate It's my ideal job > It's a guaranteed job that makes money.
	It's my ideal job.	274	44,26(7,9)	44 (24-60)			
	My family wants me to.	46	39,35(6,9)	39 (29-53)			
	It will give me a good status in society.	40	41,10(7,2)	40 (21-55)			
	It's a guaranteed job that makes money.	76	41,50(7,2)	40 (22-57)			

Variable		N	Mean (St. Deviation)	Median (Min-Max)	Mann Whitney U (p)	Kruskal Wallis (p)	Significant Difference
The status of following medicine-related resources other than course presentations and resources suggested by the faculty member	Yes	312	44,08(7,1)	42 (30-60)	21254 (<0,0001)	----	Yes > No
	No	186	40,38(8,3)	40 (21-58)			
Desire to be a specialist in the future after being successful in the Medical Specialization Examination (TUS)	Yes	442	43,27(7,6)	41 (21-60)	7926 (<0,0001)	----	Yes > No
	No	56	38,18(7,4)	39 (22-54)			

**Analysis was made of the general total scores obtained from 12 items of the scale. Four items with negative significance were coded in reverse when calculating the total score. A high score indicates a positive attitude towards the pharmacology course.*

According to the analysis of results;

- The gender of the students did not make a difference in the attitude towards the pharmacology course ($p > .05$).
- There was a significant difference in the students' attitudes towards the pharmacology course in the period they were educated ($p < .05$). Attitudes of term 5 students were significantly more positive than those of term 4 and term 6 students.
- The reasons for choosing the medical school of the students created a significant difference in their attitudes towards the pharmacology course ($p < .05$). The attitudes of those who have the ideal profession of studying medicine and being a doctor were significantly more positive than students who study medicine because it is a profession that is guaranteed to earn money and because the exam score was sufficient.
- There was a significant difference in the attitudes towards the pharmacology course according to the status of following medical resources other than those provided by the lecturers ($p < .05$). Apart from the lecture presentations and the resources suggested by the lecturer, the attitudes of those who follow medical resources are significantly more positive than those who do not.
- A significant difference was determined between the attitudes towards the pharmacology course of those who want to become a specialist by passing the Medical Specialization Examination (TUS) after graduation and those who do not ($p < .05$). The attitudes of students who want to become specialists are significantly more positive than those who do not want to become specialists.

The results in the context of the data obtained in this study are as follows:

1. The scale of attitude of medical school students towards pharmacology course is a scale that provides valid and reliable data with 12 items and two factors.
2. Although the students reached high mean and median values in two negative significant items of the pharmacology attitude scale, they reached high mean and median values in mostly positive significant items. In summary, attitudes are generally positive.
3. The gender of the students does not make a difference in the attitude towards the pharmacology course.
4. There was a significant difference in the attitudes of the students towards the pharmacology course in the period they were educated.
5. The reasons for choosing the medical school of the students created a significant difference in their attitudes towards the pharmacology course.
6. There was a significant difference in the attitudes towards the pharmacology course,

according to the students' status of following medical resources other than course presentations and medical resources suggested by the lecturers.

7.A significant difference was determined between the attitudes of those who want to become a specialist by passing the TUS and those who do not, towards the pharmacology course.

DISCUSSION

Learning pharmacology is an important subject for medical school students because it helps them to understand the clinical processes involved in managing diseases (1). The pharmacology course is very comprehensive and contains a lot of information, which can make it difficult to learn (4). Moreover, it is also interconnected with other disciplines, such as physiology and biochemistry, which can make it even more difficult to learn (1). These difficulties may cause students to overestimate the lesson, and this can lead to students fearing and avoiding the lesson. This can lead to negative attitudes towards the course (1). For example, a student might see pharmacology as a pointless subject that is just memorized and forgotten. They might think that no matter how hard they study, they will forget the information anyway, so they might just focus on getting enough points to pass the exam. This prevents them from learning the material in a meaningful way. The sheer volume of information that students need to memorize can be daunting, and the pressure to succeed can be intense (4). If a student sees pharmacology as just memorizing drug names and uses the memorization method instead of trying to understand simple mechanisms, they will forget this information in a short time. This will make them even more likely to see the course as a waste of time, which can have a negative impact on their educational success overall. Therefore, it is important to identify students' attitudes towards pharmacology early on and to take steps to address them. For this purpose, in this study, I aimed to develop an attitude scale by evaluating students' attitudes towards the pharmacology course.

Attitudes are an intrinsic aspect of health professional students' inner selves when completing clinical education placements, internships, or clerkships. They are an internal component of their psyche, are enduring, and influence their values, beliefs, and internal dialogue (28). Developing and maintaining proper attitudes by medical students can impact on the quality of health care delivered to their patients as they assume the role of doctors (9). Medical students should be empowered to take control of their own clinical learning through a variety of attitudes and actions that can enhance their educational experience, elicit teaching from residents and faculty, and support a positive learning environment (9). A positive attitude can help students succeed in various aspects of their lives, including academics, mental health, and relationships. Research has shown that students with a positive attitude are more likely to be motivated to learn and to persevere in the face of challenges (5,6).

In this study, an attitude scale towards the pharmacology course was developed with the participation of students of Canakkale Onsekiz Mart University, Faculty of Medicine, term 3, 4, 5, and 6 in the 2022-2023 academic year. The scale was found to be valid and reliable with two factors: the first factor measuring positive attitudes towards pharmacology and the second factor measuring negative attitudes towards pharmacology.

The item "Pharmacology course is essential in medical education" had the highest score. Together with the item "Pharmacology provides a foundation for service delivery in all other fields of medical science" these items support and confirm the importance of the pharmacology course in medical education. They exemplify the factor of "Pharmacology as an indispensable course in medical education". Pharmacology is a core component of medical education because it is essential for the safe and

effective use of medications, which are a cornerstone of modern medicine (1,3). It has been shown that the prescribing/pharmacology course in undergraduate medical education is among the courses that require more focus and has been one of the more demanded courses by students. All of the specific areas mentioned including pharmacology are required skills for medical professionals. More time and attention should be devoted to these areas to prepare medical students for the challenges of clinical practice (29).

The item "Pharmacology knowledge should be refreshed at the beginning of each clinical internship" supports the fundamentals of the pharmacology course and its essential role in medicine. It also shows how pharmacology is intertwined with other disciplines. The fact that it is linked to many other disciplines (4) is one of the challenges for pharmacology education.

The item “Pharmacology courses are interesting when taught as rational drug use” indicates the interest of students in rational drug use. A study evaluating student feedback on rational prescribing education showed that this type of education was interesting and informative (19). A review study evaluating research on rational drug education found that students were generally satisfied with the program and performed well in knowledge and skill tests (30).

The items “Learning about drugs and their mechanisms of action in pharmacology makes me feel like a doctor” and “Learning pharmacology makes me happy” support the increase in the student’s self-confidence and satisfaction level as they learn the pharmacology course. This is related to the process of medical education. After learning basic subjects such as anatomy and physiology in the first two years of medical school, the student starts to learn about diseases and drugs used in their treatment only in the third year. Therefore, the student begins to feel like a doctor and becomes happier as they learn the mechanisms of action, the situations in which they are used, and the side effects of the drugs used in the treatment. Studies evaluating students’ attitudes towards pharmacology (20,21) have found that the pharmacology course is generally considered to be useful and interesting, and none of the students stated that it was a useless and boring course. When students were asked to compare pharmacology with other courses, about half of them stated that they considered it superior to all others (21). On the other hand, in another study, students evaluated pharmacology as neutral in determining their favorite course (22). It is thought that the pharmacology curriculum of the relevant institutions, the instructors’ lectures and measurement-evaluation methods play a role in these differences.

Although the students participating in this study generally showed a positive attitude towards the pharmacology course, the items "If I were the health minister, I would remove the pharmacology course from the curriculum of medical schools" and "When the word pharmacology is mentioned, I get goosebumps" are negative items with high mean and median scores. Pharmacology is a challenging course in medical school. The amount of knowledge that students need to learn is constantly increasing, which can lead to feelings of anxiety and difficulty absorbing the large amount of information required. Students also have difficulty making sense of the vast amount of information in pharmacology and applying it to real-world cases (4).

The items "I would not call a person who does not know pharmacology a physician", "A person who does not have a detailed knowledge of drugs and their mechanism of action cannot be a physician", "Just hearing the name of the pharmacology drives me crazy" and "I would like to prevent the pharmacology course from being taught in its current form" are those with relatively lower scores.

Since the items "I would not call a person who does not know pharmacology a physician" and "A person who does not have a detailed

knowledge of drugs and their mechanism of action cannot be a physician" contain sharp statements about the definition of a physician, it was concluded that the students partially agreed with these statements due to their feelings of inadequacy in the pharmacology course.

The item "I would like to prevent the pharmacology course from being taught in its current form" is a negative item with a relatively low score. This can be interpreted as a partial acceptance of the current delivery of the course by the students in the institution in general.

In summary, this scale, which was developed to determine the attitudes of medical faculty students towards the pharmacology course, included items that examined the positive and negative thoughts suggested in the literature.

In the study, it was determined that medical faculty students generally had positive attitudes towards the pharmacology course. However, there were some differences in the attitudes of the students depending on the year of education, the reasons for choosing the medical faculty, and their future plans.

The gender of the students did not make a difference in their attitudes towards the pharmacology course. In fact, it was not surprising that no gender difference was shown, and these results are compatible with the results of a scale development study conducted in a different branch such as anatomy (10). However, there was a significant difference in the attitudes of the students towards the pharmacology course according to the period of education. The attitudes of term 5 students were significantly more positive than those of term 4 and term 6 students. It can be interpreted that the one-week rational drug use training conducted by the pharmacology department, which the 5th term students attend as a compulsory course in our faculty, has an effect on these results.

When the reasons for choosing medical school are examined, the attitude of those who have the ideal profession of studying medicine and being a doctor is significantly more positive than the attitudes of students who study medicine because it is a profession that is guaranteed to earn money and because the exam score is sufficient. In addition, the attitudes of those who follow medical resources besides the lecture presentations and the resources suggested by the lecturer, and those who want to become a specialist by passing the TUS after school are significantly more positive. Medical education is a challenging process, so it is not surprising that those who willingly choose this path and have a specific goal of specialization show more positive attitudes.

Schools should create a positive learning environment that enhances students' attitudes and motivates them to learn. This can be done by providing high-quality instruction, support from teachers, and clear and consistent expectations. Evaluating the attitudes of medical students on the pharmacology course is important for planning the pharmacology curriculum and taking corrective measures in medical education. Instructors have important duties in correcting negative perceptions about the course. At this point, it will be useful to make the lesson delivery more understandable, to use graphical animations, to strengthen the information explained with examples from daily life, and to give examples through cases.

CONCLUSIONS

In conclusion, this study provides valuable insights into the factors that influence students' attitudes towards pharmacology. This information can be used to improve the teaching of pharmacology and to help students develop more positive attitudes towards the subject. The attitude scale developed in this study can be used in future studies to evaluate attitudes about different sub-topics.

Limitations

In this study, I developed the pharmacology attitude scale using data from Canakkale Onsekiz Mart University Faculty of Medicine students. One limitation of the study is that the validity and reliability evidence of the scale is

based on data from students of only one state university. Additionally, I did not calculate the content validity index based on the expert opinions I received during the preparation of the draft scale form. Readers should consider these limitations when interpreting the research results.

REFERENCES

1. Norris ME, Cachia MA, Johnson MI, Rogers KA, Martin CM. Expectations and Perceptions of Students' Basic Science Knowledge: Through the Lens of Clerkship Directors. Med Sci Educ. 2020;30(1):355–65.

2. Fidalgo-Neto AA, Lopes RM, Ribeiro RRM, de Souza CAM, de Souza Cavalcanti RL, da Silva Ferreira NC, et al. Teaching and learning pharmacology in Brazil before COVID-19 pandemic: a case study in Rio de Janeiro. BMC Med Educ. 2023;23(1):471.

3. Quesnelle KM, Zaveri NT, Schneid SD, Blumer JB, Szarek JL, Kruidering M, et al. The importance of collaboratively designing pharmacology education programs. Pharmacol Res Perspect. 2021;9(3):e00773.

4. McHugh D, Yanik AJ, Mancini MR. An innovative pharmacology curriculum for medical students: promoting higher order cognition, learner-centered coaching, and constructive feedback through a social pedagogy framework. BMC Med Educ. 2021;21(1):90.

5. Finch A. Attitude Change Through Learning. In: Encyclopedia of the Sciences of Learning. Boston, MA: Springer US; 2012. p. 369–71.

6. Lipnevich AA, Gjicali K, Krumm S. Understanding Attitudes in Education. In: Non-cognitive Skills and Factors in Educational Attainment. Rotterdam: SensePublishers; 2016. p. 111–27.

7. Brown T, Isbel S, Yu ML, Bevitt T. Measuring attitudes: Current practices in health professional education. In: Clinical Education for the Health Professions. 1st ed. Singapore: Springer; 2021. p. 1–28.

8. Martin J, Lloyd M, Singh S. Professional attitudes: can they be taught and assessed in medical education? Clinical Medicine. 2002;2(3):217–23.

9. Woloschuk W, Harasym PH, Temple W. Attitude change during medical school: a cohort study. Med Educ. 2004;38(5):522–34.

10. Can MA. Development of an Anatomy Attitude Scale for Medical School Students and Analysis of Their Attitudes. J Educ Environ Sci Health. 2022;8(2):187–99.

11. Waseem N, Iqbal K, Anwar N, Rehman I, Kundi H, Qamar A. Medical students' attitudes towards the clinical importance of embryology. J Pak Med Assoc. 2021;71(4):1167–70.

12. Xu C, Li Y, Chen P, Pan M, Bu X. A survey on the attitudes of Chinese medical students towards current pathology education. BMC Med Educ. 2020;20(1):259.

13. de Cates AN, de Cates P, Singh SP, Marwaha S. Can curriculum design influence medical students' attitudes to psychiatry? A comparison of two different approaches. Med Teach. 2019;41(8):939–48.

14. Hull W, Jewell E, Shabir S, Borrows R. Nephrophobia: a retrospective study of medical students' attitudes towards nephrology education. BMC Med Educ. 2022;22(1):667.

15. Abulaban AA, Obeid TH, Algahtani HA, Kojan SM, Al-Khathaami AM, Abulaban AA, et al. Neurophobia among medical students. Neurosciences (Riyadh). 2015;20(1):37–40.

16. Ishwar MS, Hiremath SV, Torgal SS. Students' attitude towards different evaluation methods in pharmacology. Int J Res Ayurveda Pharm. 2012;3(4):622–8.

17. Powers CA, Carroll MA. Student Attendance at Pharmacology Lectures and Its Relation to Exam Performance in the Era of Lecture Capture: A Two-Year Analysis. Res Sq. 2020;

18. Zgheib NK, Simaan JA, Sabra R. Using Team-based Learning to Teach Clinical Pharmacology in Medical School: Student Satisfaction and Improved Performance. The Journal of Clinical Pharmacology. 2011;51(7):1101–11.

19. Shankar PR, Dubey AK, Upadhyay DK, Subish P, Alwar MC. Educational sessions on assessing rationality of prescriptions: Student feedback. Pharmacy Education. 2006;6(3):191–5.

20. Chavda N, Yadav P, Karan J, Kantharia N. Second MBBS medical student's feedback on teaching methodology and evaluation methods in Pharmacology. Natl J Physiol Pharm Pharmacol. 2011;1(1):23–31.

21. Bhosale UA, Yegnanarayan Radha, Yadav GE. Attitude, perception and feedback of second year medical students on teaching–learning methodology and evaluation methods in pharmacology: A questionnaire-based study. Nigerian Medical Journal. 2013;54(1):33–9.

22. Amberkar M, Lalit M, Kumari M, Bairy KL. A survey on methods of undergraduate pharmacology teaching. Journal of Pharmaceutical Research and Health Care. 2011;3(2):43–9.

23. Hair JF, Black WC, Babin BJ, Anderson RE, Tatham RL. In Multivariate Data Analysis. 7th ed. Essex: Pearson Education Limited Harlow; 2014.

24. Aybek EC, Toraman C. How many response categories are sufficient for Likert type scales? An empirical study based on the Item Response Theory. International Journal of Assessment Tools in Education. 2022;9(2):534–47.

25. Pett M, Lackey N, Sullivan J. Making Sense of Factor Analysis. Thousand Oaks: SAGE Publications, Inc.; 2003.

26. Warner RM. Applied Statistics: From Bivariate through Multivariate Techniques. 2nd ed. Thousand Oaks: SAGE Publications, Inc.; 2013.

27. Nunnally JC, Bernstein IH. Psychometric theory. 3rd ed. New York: McGraw-Hill; 1994.

28. Leaune E, Rey-Cadilhac V, Oufker S, Grot S, Strowd R, Rode G, et al. Medical students attitudes toward and intention to work with the underserved: a systematic review and meta-analysis. BMC Med Educ. 2021;21(1):129.

29. Miles S, Kellett J, Leinster SJ. Medical graduates' preparedness to practice: a comparison of undergraduate medical school training. BMC Med Educ. 2017;17(1):33.

30. Budakoğlu İİ, Coşkun Ö, Kıyak YS, Uluoğlu C. Teaching rational prescribing in undergraduate medical education: a systematic search and review. Eur J Clin Pharmacol. 2023;79(3):341–8.