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Changes in the types of anatomy questions asked in the medical specialization exam over the years, Türkiye example

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Abstract

It is very important to try to learn Anatomy within its unique methodology and develop personalized strategies. One of the most important goals of a practitioner who graduates from medical school is to become a specialist physician. For this purpose, different specialization exams are held in different countries. Questions from the Anatomy course have a very important weight in the Medical Specialization Examination (TUS) held in Türkiye. In this article, we evaluate the specialty exam according to current anatomy education literature by revealing the question styles from an anatomist's perspective in order to learn anatomy more efficiently and develop strategies for tricky points. We analyzed 396 valid Anatomy questions asked in TUS between 2006 and 2021. Among all the questions; According to the systematic anatomy classification, neuroanatomy (35.1%, $n=139$) and according to the topographic anatomy classification, head and neck anatomy (41.4%, $n=164$) were the subjects where the most frequently asked questions. In recent years, it has become an important trend that clinical anatomy knowledge ($p<0.01$) is at the forefront in all exams and that questions with eponyms and visual content ($p=0.044$) are included in the exam. We accept that the Anatomy question styles in TUS are created with a method that is up-to-date and in accordance with the literature and requirements.

Keywords Anatomy, Anatomy eduction, Comperative clinical anatomy, Eponyms, Medical specialization exam, Topographic anatomy

Introduction

As Andrew Taylor Still said in 1899, 'You begin with Anatomy and you end with Anatomy. 'All you want or need is knowledge of Anatomy' [1].

Medical science and medical education have developed considerably since that period. However, Anatomy education continues to maintain its importance in terms of medical sciences. According to Stojanovska et al., the increase in the amount of curriculum knowledge and materials needed by medical students reduces the time devoted to anatomy [2]. Therefore, it is necessary to look for methods to learn Anatomy more efficiently and effectively.

In Türkiye, medical doctors who can work as general practitioners in primary health care after six years of medical education [3] must pass the Medical Specialization Training Entrance Exam (TUS) in order to become a specialist doctor. They can then start their specialty training as assistant physicians by choosing their preferences among different specialties [4]. The purpose of specialty training is to train physicians who have specialized

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knowledge in any of the branches of medicine in order to meet the health service needs of the society [5].

TUS is a ranking exam. In the exam, there are questions aimed at identifying the basic concepts and methods in the field of medicine, medical methodology and thinking and application skills of the candidates, according to the competition and qualification principles. The aim of TUS is to determine the candidates who will be accepted to specialization training according to the exam results and to place them in the available quotas according to the candidates' preferences [6].

TUS, which was first held in 1987 [7], is held twice a year, in the spring and fall semesters. The exam consists of two stages: Basic Medical Sciences Test (TTBT) and Clinical Medical Sciences Test (KTBT). There are 100 current questions in both sessions. The number of questions and their distribution have changed in certain years.

Candidates who will take TUS must have certain knowledge and experience not only about the specialty they want, but also in all other branches of medicine [8]. This feature of the exam is a part of its structure that increases and keeps competition alive. Candidates prepare for TUS for as long as possible with a competitive approach [3]. According to Oztek et al., intern physicians spend 4 h a day and graduate physicians spend an average of 4.1 h a day preparing for TUS [8].

Bloom's taxonomy is an approach to classifying cognitive skills. It is widely used in higher education (especially by medical educators [9] to delineate educational objectives. According to the taxonomy, cognitive skills follow a cumulative hierarchical order, starting from the lowest level: 'remember', 'understand', 'apply', 'analyze', 'evaluate' and 'create' [10]. Higher-level cognition corresponds to cognitive skills above the 'understanding' level [11].

The purpose of this study is to provide guiding data to help candidates with their Anatomy education during their exam preparation processes. We aim to assist the candidates with an Anatomist perspective in order to guide the candidates to update their long-term study period and study strategies, to study Anatomy course subjects in a more qualified manner in the light of the data to be transferred, and to develop strategies regarding the key points of the desired information. We also hope to present question styles and discuss whether they are appropriate questions according to current anatomy education literature.

Material method

For the study, the exams made available for open access on the Center for Evaluation, Selection and Placement (OSYM) website were evaluated. A total of 32 TUS TTBT question booklets, 2 exams each year between 2006 and 2021, were examined on the OSYM official website.

In the categorization of the questions, the questions were classified according to their subjects under the headings of Systematic and Topographic Anatomy. The subheadings of Systematic Anatomy were determined as nervous, musculoskeletal, circulatory, respiratory, digestive, urogenital and endocrine system. Topographic Anatomy subheadings are head and neck region, thorax, abdomen, pelvis and perineum, upper extremity and lower extremity.

We also classified the questions according to Bloom's taxonomy. We identified the questions that showed a high level of cognition and examined their distribution by year. The questions were classified separately by two independent researchers. Then, comparisons were made. The final decision was made by consensus on the issues where there was disagreement in the distribution of the questions.

It was also noted whether the questions contained picture or eponym information and the necessity of knowing clinical inferences and relationships in solving the questions.

A classification was made within anatomy terminology to determine what was asked in the question stem. In this classification, each question was determined based on keywords such as function, branching or anastomosis, drainage, structure or components of the organ, dermatome areas, path (trace) or stenosis of the structure, location or projection, neighborhoods, vascular structure or nutrition.

In the exams for which exam evaluation reports were published, the average number of correct answers, difficulty levels, discrimination indices and internal consistency coefficients for both TTBT and Anatomy test questions were obtained [12].

Statistical analysis

SPSS 28.0 statistical package program was used in the analysis phase of the data. Descriptive statistics of the evaluation results were given as numbers and percentages for categorical variables. Chi-square test was used to determine the differences between categorical variables. Significance value was accepted as $p < 0.05$.

Results

The number of Anatomy questions between the spring semester of 2006 and the fall semester of 2011 is 10, and the number of Anatomy questions after this period is 14. Although the current number of questions is 13, data analysis was performed on the open access exams for our study. Exams from other semesters do not have open access. Considering the variable table in the number of questions, we found it appropriate to evaluate the data in terms of percentage values.

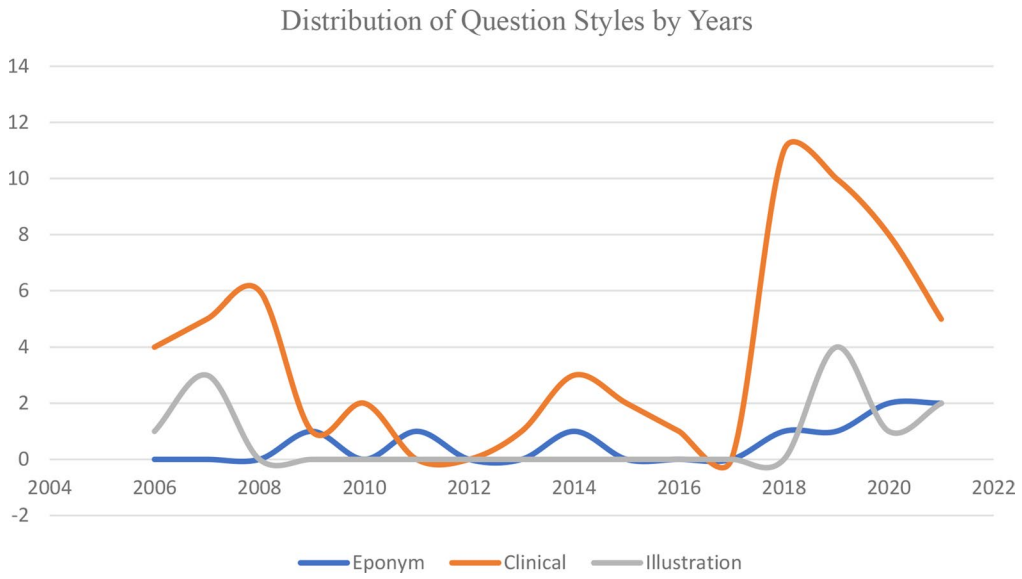


Fig. 1 An increasing trend in Clinical Anatomy question style is noticeable. In addition, we can see that eponym and illustration questions have been asked by candidates in all years after 2018

Table 1 Questions that included clinical information and visual content began to be asked more frequently after 2017

	Clinical question			p	Visual content question			p
	No	Yes	Total		No	Yes	Total	
2016 and Before	232 % 90.28	25 % 9.72	257	< 0.01	253 % 98.45	4 % 1.55	257	0.044
2017 and After	105 % 75.54	34 % 24.46	139		132 % 94.97	7 % 5.03	139	
Total	337	59	396		385	11	396	

The number of questions in all years was 400, but 4 questions, each in different exams, were cancelled. An analysis was made on the remaining 396 questions.

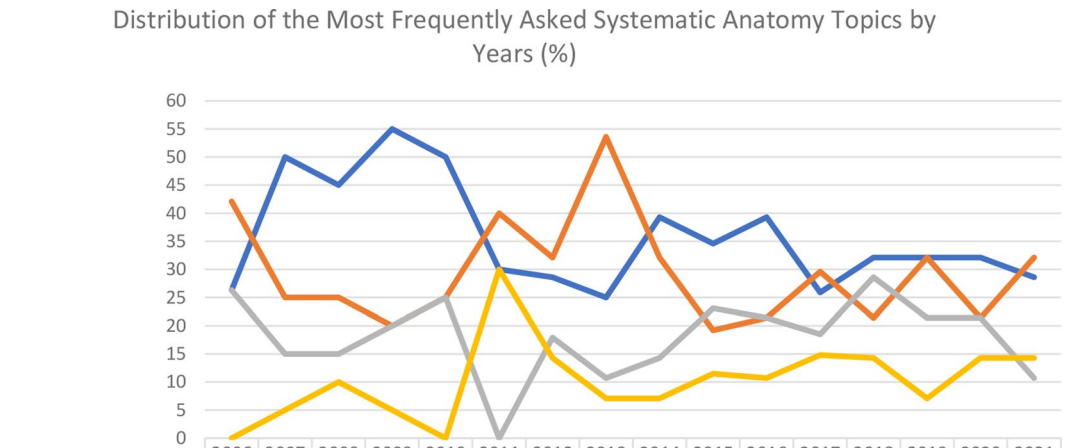
When all questions were examined, 14.9% ($n = 59$) of the questions were clinical anatomy questions and only 2.8% ($n = 11$) of the questions included visuals. The rate of questions requiring eponym information was 2.3% ($n = 9$). The distribution of such questions by years is given in Fig. 1. In recent years, a significant increase was observed in the type of clinical questions ($p < 0.01$). In the exams held in 2017 and later, 34 of the 139 questions (24.46%) were anatomy questions requiring clinical knowledge and inference. Similarly, the increase in the number of visual questions in 2017 and later (Before: 4/257 questions, after: 7/139 questions, $p = 0.044$) was statistically significant (Table 1).

According to Bloom's taxonomy, only 86 (21.7%) of the 396 questions examined in the Anatomy test reveal high cognitive evaluation. 63 questions were in the "apply" step and 23 questions were in the "analyse" step. Before 2017, 86.38% of the questions asked were evaluated in the "remember" step and 8.17% in the "apply" step. After 2017, these numbers were recorded as 58.99% and 30.21% ($p < 0.001$).

According to the systematic review, 35.1% ($n = 139$) of the valid questions to date arise from topics related to neuroanatomy. The following topic distribution is as follows; 29.5% ($n = 117$) musculoskeletal, 18.2% ($n = 72$) circulatory, 10.6% ($n = 42$) digestive, 3.3% ($n = 13$) urogenital, 3% (n) = 12) respiratory and 0.3% ($n = 1$) endocrine system. The distribution of systematic anatomy topics by year is given in Fig. 2.

According to the topographic analysis, the most questions came from the head and neck region with 164 questions (41.4%). The distribution of other regions is as follows; 12.9% abdomen ($n = 51$), 11.1% thorax ($n = 44$), 10.9% upper extremity ($n = 43$), 10.6% lower extremity ($n = 42$), 9.3% ($n = 37$) pelvis and perineum and 3.8% general anatomy ($n = 15$) (Fig. 3).

53.7% ($n = 88$) of the questions from the head and neck region included neuroanatomy topics. The structures questioned in the thorax region were the circulatory system with 43.2% ($n = 19$) and the musculoskeletal system with 27.3% ($n = 12$). The predominant questions were the digestive system with 58.8% ($n = 30$) in the abdominal region, the musculoskeletal system with 40.5% ($n = 15$) in the pelvis and perineum region, and the urogenital system with 32.4% ($n = 12$). In the extremities, the



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Neuroanatomy	26.3	50	45	55	50	30	28.6	25	39.3	34.6	39.3	25.9	32.1	32.1	32.1	28.6
Musculoskeletal	42.1	25	25	20	25	40	32.1	53.6	32.1	19.2	21.4	29.6	21.4	32.1	21.4	32.1
Circulatory	26.3	15	15	20	25	0	17.9	10.7	14.3	23.1	21.4	18.5	28.6	21.4	21.4	10.7
Digestive	0	5	10	5	0	30	14.3	7.1	7.1	11.5	10.7	14.8	14.3	7.1	14.3	14.3

Fig. 2 With the increasing number of questions after 2011, a more balanced distribution of questions emerges

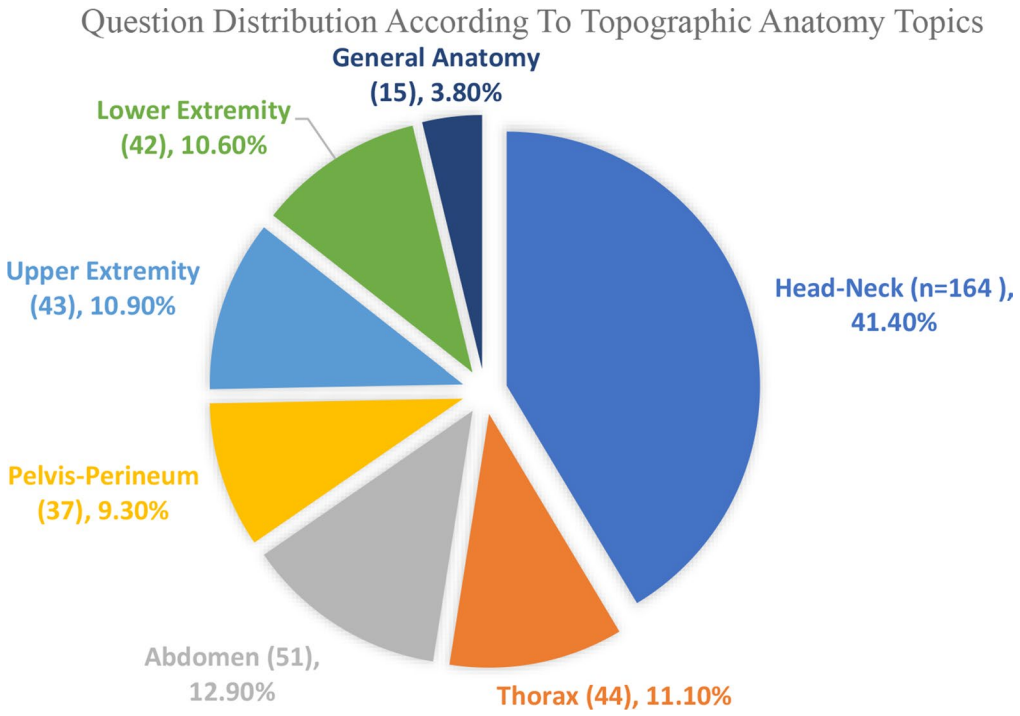


Fig. 3 The head and neck region is the topographic area where the most questions are asked

musculoskeletal system (Upper ext.: $n = 24$, 55.8%; Lower ext.: $n = 25$, 59.5%) and neuroanatomy (Upper ext.: $n = 15$, 34.9%; Lower ext.: $n = 14$, 33.3%) were the most frequently asked questions.

When examined by subject, questions were asked most frequently in the head and neck region (12.8%), sensory organs (12.2%), cranial nerves (12.2%) and topographic special regions (11%). Heart was the most frequently asked topic in the thorax region with 27.3%. Questions from peripheral nerves and muscles (11.4%) were also prevalent. The most frequently asked topics in the abdominal region were esophagus-stomach (17.6%), liver (13.7%), duodenum (11.8%) and arteries (11.8%).

The most frequently asked topics in the upper extremity were peripheral nerves with 34.9% and muscles with 27.9%. In the lower extremity, peripheral nerves (26.2%),

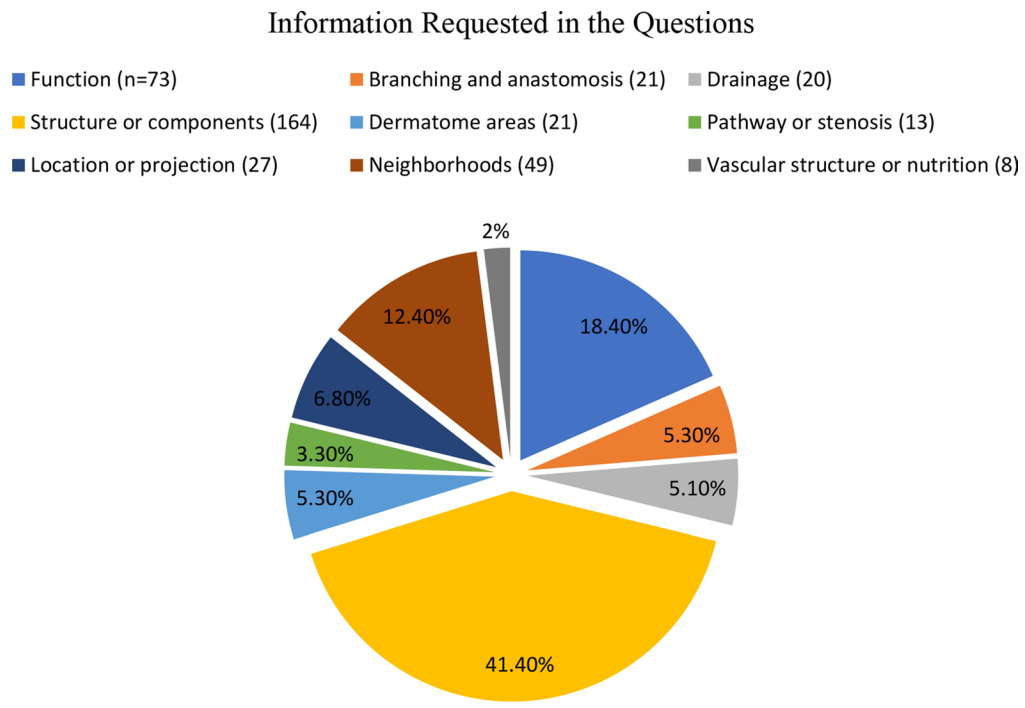


Fig. 4 In anatomy, it is important to know the structures and components of organs. However, their functions and their locations (neighborhoods) relative to each other also need to be known

Table 2 Exam assessment reports (2019-2021)

	Average of correct answers	Average difficulty level	Average discrimination index	Internal consistency coefficient in reliability analysis	Average of correct answers of Anatomy	Average difficulty level of Anatomy	Average discrimination index of Anatomy
2021 TUS-I TTBT	51,63	0,42	0,31	0,93	6,00	0,56	0,43
2021 TUS-II TTBT	53,38	0,49	0,37	0,95	6,07	0,64	0,48
2020 TUS-I TTBT	57,33	0,48	0,35	0,94	5,62	0,40	0,43
2020 TUS-II TTBT	52,93	0,44	0,34	0,94	3,95	0,28	0,39
2019 TUS-I TTBT	51,80	0,43	No data	0,93	5,97	0,43	No data
2019 TUS-II TTBT	53,48	0,45	No data	0,93	5,97	0,43	No data

bones (16.7%), ligaments (16.7%) and muscles (14.3%) were concentrated.

Questions asking about the structure and contents of organs had the highest rate with 41.4% ($n=164$). Questions about the functions and duties of buildings were the second most requested information, with 18.4% ($n=73$). Following these, 12.4% ($n=49$) of the neighborhood, 6.8% ($n=27$) of the location of the organs, 5.3% ($n=21$) of the branches, anastomoses and dermatome areas, 5.1% ($n=20$), venous drainage was questioned with 3.3% ($n=13$), the path or trace of the structure was questioned with 2% ($n=8$) and vascular structure was questioned with 2% ($n=8$) (Fig. 4).

The average number of correct answers, difficulty levels, discrimination indices, and internal consistency coefficients for both TTBT and Anatomy test questions are given in Table 2. These data were only available for the years 2019, 2020, and 2021.

Discussion

According to the Edinburgh Declaration (1988), the aim of medical education is to train physicians to improve the health of all people. The World Federation of Medical Education has set its goals as improving the quality of medical education worldwide and has defined certain international standards for quality medical education [13,

14]. In our country, studies are carried out to update and develop medicine and medical specialty training. In the statistical analyses conducted in recent years, it has been observed that the question levels, discrimination indices and internal consistency coefficients of the exam are at reasonable and acceptable levels [12].

When the exam was examined according to Bloom's taxonomy, it was seen that questions with higher cognitive levels were asked in recent years. The literature mentions the differences between the perceived cognitive level in the questions asked by the instructors and the level perceived by the students [15]. However, there are also studies that use this taxonomy as a tool in terms of the teaching objectives of anatomy education [16]. Instructors who prepare multiple-choice exams can receive training in preparing high-quality multiple-choice questions and preventing possible common errors [17]. This can increase the validity and reliability of the exams. When we look at the analyses such as difficulty level, discrimination index and internal consistency, which are limited but made for TUS, it is possible to say that the question preparation team is quite competent in preparing multiple-choice questions.

12,014 candidates entered TUS in 2006 and 3392 people (28.23%) were placed in a specialty program. In the 2021 s term exam that we last reviewed, 19,103 candidates took the exam, while 5,136 people (26.88%), 264 of whom were foreign nationals, were placed in any specialty program [18]. 1007 positions remained vacant. The increasing need for doctors and specialist physicians along with the increasing population here has brought about an increase in the number of staff [7].

TUS is a very important goal in terms of the future and career planning of physicians [13]. Studies show that TUS score (72.1%) is an important factor in choosing the field of specialization, as well as areas of interest (80.3%) [19]. In this respect, we thought that analyzing anatomy questions and revealing question strategies would be a guide in the study strategies of the candidates, and we provided the opportunity to see whether the Anatomy question styles in TUS have changed according to the scientific current.

We could not find any study on the content analysis of TUS questions in the literature. The studies in the literature on examining TUS questions are limited studies on evaluating the questions through artificial intelligence-based software [20].

In recent years, "clinical anatomy" style questions, which combine question-style storytelling with clinical sciences and basic sciences, have begun to be asked quite frequently. Therefore, it has become very important to work towards this in terms of learning strategies. Terminological difficulties and study strategies aimed at memorization are at the forefront of students' hesitations about anatomy lessons, and there has been an increasing trend in recent years to use technology to develop different study strategies [21, 22]. Learning anatomy in the cause and effect relationship will help candidates to overcome this situation. In this way, the permanence of the course will increase and a more solid foundation will be created in terms of clinical sciences.

3D atlases, used together with laboratory training and increasing technological opportunities, reveal the relationships of organs with each other more realistically. This provides a great advantage in terms of visual learning strategies. In order to overcome the visual questions that we encounter in every exam since 2018, it is important to study not only theoretically but also illustrations. Studies reveal that candidates are both interested in 3D learning methods and that these applications are very useful in terms of learning and improving knowledge [23].

The results show that the subject where the most intense problems arise every semester is neuroanatomy. We can expect this due to its presence in all topographic areas and physiologically systemic effects. The fact that questions in TUS are asked in a way that includes illustrations and blends them with clinical information is actually parallel to the orientation of the candidates. Studies show that students benefit from 3D study strategies and their academic success increases in terms of anatomy course [24]. Question styles and exam techniques have been updated according to new practices. Therefore, the most important emphasis for future candidates will be on developing 3D working strategies and blending clinical knowledge with Anatomy [25–27]. The importance of clinical anatomy has been emphasized in studies, especially in terms of specialties such as rheumatology and orthopedics, which require physical examination knowledge and skills [28, 29].

As anatomists, we attach importance to terminology and using and teaching structures based on terminology. Since its creation by the Federative Committee on Anatomical Terminology (FCAT), Terminologia Anatomica (TA 1998) has consistently served as a reference point in the field [30]. Although this is not a resource adhered to by all professionals, scientific terminology should be clear, consistent and a common language accepted worldwide. It is also very important to define anatomical terms precisely [31, 32]. Recent and new changes made by the Federative International Programme on Anatomical Terminology (FIPAT) [33] reveal the emphasis on "clinical anatomy" [34]. The new version of anatomical terminology includes both modern and traditional terms, showing how alive and changing the anatomical language is. In general, clinically useful terms have been approved by FIPAT and there appears to be work towards greater precision and consistency, which is important in clinical

practice [32, 34]. The fact that eponym knowledge has started to be asked in all exams at TUS since 2018 reminds us that we should not break away from the traditional aspect of terminology.

Considering all these innovations, we can easily say that our teachers who prepare the Anatomy questions in the Medical Specialization Exam create the questions with a method that is up-to-date and appropriate to the age and requirements. The most important limitation is that the exam cannot be approached in a holistic manner. Therefore, we remain silent on whether the approach to the Anatomy questions covers the entirety of the exam. Since it is not possible to evaluate the exam in general in our study, presenting studies on other departments may reveal that the exam as a whole has developed in accordance with the requirements and innovations of the period.

Conclusion

The clinical dimension that has been introduced in anatomy education in recent years has also made itself felt in the medical specialty exam. During the exam process, candidates' skills such as thinking, inference and establishing relationships have also begun to be tested. In addition to the pure theoretical learning of anatomy, it is very important to blend visual and clinical information.

Abbreviations

TUS	Medical Specialization Examination in Türkiye
TTBT	Basic Medical Sciences Test
KTBT	Clinical Medical Sciences Test
OSYM	Center for Evaluation, Selection and Placement
FCAT	Federative Committee on Anatomical Terminology
FIPAT	Federative International Programme on Anatomical Terminology

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Author contributions

TA and AK participated in the formulation of hypotheses and ideas, study planning, and data collection. NY and TA participated in the acquisition of statistical data and the evaluation of results. TA, AK, and NY participated in the writing of the manuscript.

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Data availability

All questions that form the basis of the study can be accessed from the OSYM official website. Otherwise, all processed data can be shared by the authors upon request.

Declarations

Ethics approval and constenet to participate

Permission for the study was obtained from the Karadeniz Technical University Health Sciences Scientific Research Ethics Committee (Date, 03.06.2024, No: 2024/88).

Consent for publication

All necessary permissions have been granted to BMC Medical Education by all authors.

Competing interests

The authors declare no competing interests.

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References

1. Tubbs RS. You begin with anatomy, and you end with anatomy. Clinical anatomy (New York, N.Y), United States, Mar 2021;34(2):169. https://doi.org/10.1002/ca.23723
2. Stojanovska M et al. Mixed reality anatomy using microsoft hololens and cadaveric dissection: a comparative effectiveness study. Med Sci Educ. Mar 2020;30(1):173–178.https://doi.org/10.1007/s40670-019-00834-x
3. Turan S, Üner S. Preparation for a postgraduate specialty examination by medical students in Turkey: processes and sources of anxiety. Teach Learn Med. 2015;27(1):27–36. https://doi.org/10.1080/10401334.2014.979186.
4. Öztürk N, Gençtürk M. A research on the factors affecting the preference of medical specialization branches. J Med Sci. 2022;91(3):169–80. https://doi.org/10.20883/medical.e691.
5. YEŞİLTAŞ A. History of medical specialization and from specializating in medicine to over specialization. Turkiye Klin J Med Ethics-Law Hist. 2019;27(1):65–72. https://doi.org/10.5336/mdethic.2018-61377.
6. ÖSYM, About the TUS. 2024. https://www.osym.gov.tr/TR,8854/hakkinda.html
7. Kaya A, Aktürk Z, Çayır Y, Taştan K. Medical specialization exams between 2007–2013: A trend analysis. Ankara Med J. 2014;14(2):53–8.
8. Öztek Z, et al. Tıpta Uzmanlık Sınavına Hazırlanan Tıp öğrencileri ve Doktorlarda depresyon ve Ilaç Kullanımı depression and drug use among medical students and physicians who are studying for the specialty training acceptance examination. Maltepe Tıp Derg. 2018;10(2):54–7.
9. Monrad SU, et al. What faculty write versus what students see? Perspectives on multiple-choice questions using Bloom's taxonomy. Med Teach. May 2021;43(5):575–82. https://doi.org/10.1080/0142159X.2021.1879376.
10. Krathwohl DR. A Revision of Bloom's Taxonomy: An Overview, Theory Pract. Nov. 2002;41(4):212–218. https://doi.org/10.1207/s15430421tip4104_2
11. Liu Q, Wald N, Daskon C, Harland T. Multiple-choice questions (MCQs) for higher-order cognition: perspectives of university teachers. Innov Educ Teach Int. 2024;61(4):802–14. https://doi.org/10.1080/14703297.2023.2222715.
12. OSYM. Exam Assessment Reports. https://www.osym.gov.tr/TR,13651/sinav-degerlendirme-raporlari.html
13. CANSEVER İH, METİN A, KİŞİ M. Tıp öğrencilerinin Tıpta Uzmanlık Tercihlerini Etkileyen faktörler Üzerine Sistematik Derleme. OPUS Uluslararası Toplum Araştırmaları Derg. 2020;15(27):791–812. https://doi.org/10.26466/opus.646193.
14. The Edinburgh Declaration Medical Education, in World Conference on Medical Education of the World Federation for Medical Education, Edinburgh. 1988. [Online]. Available: https://wfme.org/download/the-edinburgh-declaration/
15. Zaidi NB, Hwang C, Scott S, Stallard S, Purkiss J, Hortsch M. Climbing Bloom's taxonomy pyramid: Lessons from a graduate histology course. Anat Sci Educ. Sep. 2017;10(5):456–464. https://doi.org/10.1002/ase.1685
16. Montello MB, Bezerra de Moura SA, Abreu BJ. Bloom's taxonomy as a tool for educational objectives applied to human anatomy. Morphologie. Mar. 2025;109(364):100943. https://doi.org/10.1016/j.morpho.2024.100943.
17. Gupta V, Williams ER, Wadhwa R. Multiple-Choice tests: A-Z in best writing practices. Psychiatr Clin North Am. Jun. 2021;44(2):249–61. https://doi.org/10.1016/j.psc.2021.03.008.
18. ÖSYM TUS. Yerleştirme Sonuçlarına İlişkin Sayısal Bilgiler, 2024. https://www.osym.gov.tr/TR,21387/2021-tus-2-donem-yerlestirme-sonuclarina-iliskin-sayisal-bilgiler.html (accessed Jun. 27, 2024).
19. Dörtyol BGöktaş. Future thoughts and career choices of last year of medical faculty students and affectıng factors. Tıp Eğitimi Dünyası. 2017;50:12–21.
20. Oztermeli AD, Oztermeli A. ChatGPT performance in the medical specialty exam: an observational study. Med (Baltim). Aug. 2023;102:e34673. https://doi.org/10.1097/MD.0000000000034673.

21. Donkin R, Rasmussen R, Student Perception and the Effectiveness of Kahoot!: A Scoping Review in Histology, Anatomy, and, Education M Anat Sci Educ. Sep. 2021;14(5)572–585. https://doi.org/10.1002/ase.2094
22. Adams JA, Dewsbury BM. Student preference for course approach to pedagogically different methodologies in anatomy and physiology. Adv Physiol Educ. Mar. 2022;46(1):45–55. https://doi.org/10.1152/advan.00137.2020
23. Triepels CPR, et al. Does three-dimensional anatomy improve student understanding? Clin Anat. Jan. 2020;33(1):25–33. https://doi.org/10.1002/ca.23405.
24. Chytas D, Noussios G, Salmas M, Demesticha T, Vasiliadis AV, Troupis T. The effectiveness of three-dimensional printing in undergraduate and postgraduate anatomy education: A review of reviews. Morphologie. Jun. 2024;108(361);100759. https://doi.org/10.1016/j.morpho.2023.100759
25. van Cappellen A-M, van Walsum, Henssen DJHA. E-Learning Three-dimensional anatomy of the brainstem: Impact of different microscopy techniques and spatial ability. Anat Sci Educ. Mar. 2022;15(2);317–329. https://doi.org/10.1002/ase.2056
26. Clifton W, Damon A, Soares C, Nottmeier E, Pichelmann M. Investigation of a three-dimensional printed dynamic cervical spine model for anatomy and physiology education. Clin Anat. Jan. 2021;34(1):30–39. https://doi.org/10.1002/ca.23607
27. Chytas D, et al. Three-dimensional printing in anatomy teaching: current evidence. Surg Radiol Anat. Jul. 2020;42(7):835–41. https://doi.org/10.1007/s00276-020-02470-2.
28. Villaseñor-Ovies P, Navarro-Zarza JE, Canoso JJ. The rheumatology physical examination: making clinical anatomy relevant. Clin Rheumatol. Mar. 2020;39(3):651–657. https://doi.org/10.1007/s10067-019-04725-9
29. Torralba KD, Villaseñor-Ovies P, Evelyn CM, Koolaee RM, Kalish RA. Teaching of clinical anatomy in rheumatology: a review of methodologies. Clin Rheumatol. Jul. 2015;34(7):1157–63. https://doi.org/10.1007/s10067-015-2984-0.
30. Chmielewski PP. Exploring the uncharted: Missing anatomical names in the Terminologia Anatomica. Clin Anat Mar. 2024;37(2):193–200. https://doi.org/10.1002/ca.24109
31. Waschke J. Terminologia anatomica: evolution but not revolution. Anat Sci Int. Mar. 2024. https://doi.org/10.1007/s12565-024-00760-y.
32. Chmielewski PP, Domagała ZA. Terminologia anatomica and its practical usage: pitfalls and how to avoid them. Folia Morphol (Warsz). 2020;79(2):198–204. https://doi.org/10.5603/FM.a2019.0086.
33. FIPAT, TERMINOLOGIA ANATOMICA. in Federative international programme for anatomical terminology. Stuttgart: FIPAT.library.dal.ca.; 2019.
34. Chmielewski PP. New terminologia anatomica highlights the importance of clinical anatomy. Folia Morphol (Warsz). 2020;79(1):15–20. https://doi.org/10.5603/FM.a2019.0048.

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