



## Motivation For Learning Anatomy Among Dental Students: A Comparative Study Across Health Profession Education Programs

## Diş Hekimliği Öğrencilerinde Anatomi Öğrenme Motivasyonu: Sağlık Meslekleri Eğitim Programları Arasında Karşılaştırmalı Bir Çalışma

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### ABSTRACT

**Objectives:** This study aimed to evaluate and compare motivation subscales among anatomy students from pharmacy, physiotherapy, and dentistry programs and to explore their influence on anatomy performance.

**Materials and Method:** A 31-item survey, the Motivated Strategies for Learning Questionnaire (MSLQ), was administered to health profession students from dentistry, physiotherapy, and pharmacy programs. The questionnaire assessed goal orientation, task value, control of learning beliefs, self-efficacy, and test anxiety. Participation was voluntary. The study was conducted at Kocaeli Health and Technology University during the 2023-2024 academic year, spring semester. Midterm and final grades were collected from anatomy courses to assess academic performance. The MSLQ was used to evaluate motivation subscales among students from Dentistry, Physiotherapy, and Pharmacy. Academic performance was assessed using midterm and final grades, and correlations between motivation subscales and academic success were analyzed statistically.

**Results:** A total of 159 participants were included. Significant differences in motivation subscales were observed among students. Female students showed higher test anxiety, intrinsic goal orientation, and task value than male students. Physiotherapy students scored higher in motivational subscales, particularly in test anxiety, although these differences were not statistically significant. A weak positive correlation was found between motivation scores and academic performance, with higher self-efficacy and learning beliefs associated with better grades.

**Conclusion:** Motivation subscales, including self-efficacy, goal orientation, and test anxiety, significantly impact academic performance in health profession students. Addressing these factors through targeted interventions could improve anatomy education outcomes.

**Keywords:** Anatomy, Dental education, Health occupations, Surveys and questionnaires

### ÖZET

**Amaç:** Bu çalışma, eczacılık, fizyoterapi ve diş hekimliği programlarında öğrenim gören anatomi öğrencilerinin motivasyon alt ölçeklerini değerlendirmeyi ve karşılaştırmayı, ayrıca bunların anatomi başarısı üzerindeki etkisini araştırmayı amaçlamıştır.

**Gereç ve Yöntem:** 31 maddeden oluşan "Motivated Strategies for Learning Questionnaire (MSLQ)" anketi, diş hekimliği, fizyoterapi ve eczacılık programlarında öğrenim gören sağlık bilimleri öğrencilerine uygulanmıştır. Anket; hedef yönelimi, görev değeri, öğrenme inançlarının kontrolü, öz-yeterlik ve sınav kaygısını değerlendirmiştir. Katılım gönüllülük esasına dayalıdır. Çalışma, 2023-2024 akademik yılı bahar döneminde Kocaeli Sağlık ve Teknoloji Üniversitesi'nde yürütülmüştür. Akademik başarıyı değerlendirmek amacıyla anatomi derslerinin ara sınav ve final notları toplanmıştır. Öğrencilerin motivasyon alt ölçekleri MSLQ ile ölçülmüş, motivasyon alt ölçekleri ile akademik başarı arasındaki korelasyonlar istatistiksel olarak analiz edilmiştir.

**Bulgular:** Çalışmaya toplam 159 öğrenci dahil edilmiştir. Öğrenciler arasında motivasyon alt ölçeklerinde anlamlı farklılıklar gözlenmiştir. Kadın öğrenciler, erkek öğrencilere kıyasla daha yüksek sınav kaygısı, içsel hedef yönelimi ve görev değerine sahip bulunmuştur. Fizyoterapi öğrencileri motivasyon alt ölçeklerinde, özellikle sınav kayısında daha yüksek puan almış, ancak bu farklar istatistiksel olarak anlamlı bulunmamıştır. Motivasyon skorları ile akademik başarı arasında zayıf pozitif bir korelasyon saptanmış; yüksek öz-yeterlik ve öğrenme inançlarının daha iyi notlarla ilişkili olduğu görülmüştür.

**Sonuç:** Öz-yeterlik, hedef yönelimi ve sınav kaygısı gibi motivasyon alt ölçekleri, sağlık bilimleri öğrencilerinin akademik başarısını önemli ölçüde etkilemektedir. Bu faktörlerin hedefe yönelik müdahalelerle ele alınması, anatomi eğitiminde öğrenim çıktılarının geliştirilmesine katkı sağlayabilir.

**Anahtar Kelimeler:** Anatomi, Anketler ve soru formları, Diş hekimliği eğitimi, Sağlık meslekleri

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## Introduction

Anatomy is a fundamental subject in health profession education, providing essential knowledge that underpins clinical practice across various disciplines.<sup>1</sup> Mastery of anatomy is crucial for developing clinical skills and for understanding the structural basis of health and disease. Despite its importance, learning anatomy is often described as one of the most demanding challenges in health sciences curricula. Students must master an extensive volume of content, integrate abstract spatial relationships, and apply this knowledge in practical and clinical contexts, which can provoke significant stress and cognitive overload.<sup>2</sup> These challenges show the necessity of identifying factors that enhance student engagement and support sustained learning in anatomy courses. Motivation plays a critical role in the learning process, influencing how students approach their studies, manage their time, and ultimately succeed academically. Motivation influences not only the extent to which students invest effort in their studies but also how they regulate their time, cope with stress, and persist through academic challenges.<sup>3</sup> High levels of motivation are associated with greater resilience in the face of academic difficulties, improved performance outcomes, and deeper learning approaches. Conversely, low motivation or maladaptive motivational beliefs can exacerbate anxiety, hinder performance, and contribute to disengagement. Understanding the factors that motivate students to engage with this demanding subject can be key to enhancing learning outcomes and academic performance. The Motivated Strategies for Learning Questionnaire (MSLQ) has been widely used to assess various motivational and cognitive dimensions related to learning, including intrinsic and extrinsic goal orientation, task value, control of learning beliefs, self-efficacy, and test anxiety.<sup>4-6</sup>

Anatomy, with its unique combination of theoretical content and practical application, provides an ideal context to investigate the role of motivation in learning.<sup>7,8</sup> Prior studies using the MSLQ have shown its validity in examining students' reflection on their learning<sup>9</sup>, assessing engagement in medical gross anatomy courses<sup>10</sup>, and correlating motivational constructs with pathophysiology performance.<sup>11</sup> However, despite these valuable insights, limited research has compared motivation levels and their relationship with anatomy performance across students from different health disciplines, such as dentistry, pharmacy, and physiotherapy. Such a comparison is important because each discipline has distinct curricular demands, professional identities,

and learning contexts that may shape students' motivational profiles differently.

Understanding these interprofessional differences could guide specific strategies to support learning in anatomy, particularly in health education systems where anatomy is often taught as a shared foundational course. For instance, dentistry students may approach anatomy with a clinical orientation toward head and neck structures, while physiotherapy students may focus on musculoskeletal applications. Pharmacy students, on the other hand, may perceive anatomy primarily as foundational knowledge that underpins pharmacological sciences. These varying perspectives could influence how students value the subject, manage anxiety, and regulate their learning efforts.

This study therefore aimed to evaluate and compare the motivation subscales of health profession students from dentistry, pharmacy, and physiotherapy, and to investigate their relationship with anatomy performance. Ultimately, addressing motivational factors; such as enhancing self-efficacy, reducing test anxiety, and increasing task value; may help improve anatomy education outcomes and contribute to the broader goal of preparing competent health professionals. We hypothesized that (1) motivational subscale scores would differ among dentistry, pharmacy, and physiotherapy students, (2) female students would demonstrate higher test anxiety scores, and (3) higher levels of self-efficacy and task value would be associated with better anatomy performance.

## Materials and Method

The study was conducted at the Faculties of Dentistry, Pharmacy, and Physiotherapy of Kocaeli Health and Technology University. Ethical approval was obtained from the Non-Invasive Clinical Research Ethics Committee of Kocaeli Health and Technology University (Project No: 2024-76), in accordance with the principles outlined in the Declaration of Helsinki. To ensure participant confidentiality, all student information was anonymized. Informed consent was obtained from all individuals prior to participation. Sampling was based on voluntary participation using a convenience sampling approach among students from all three faculties. First-year students from the Faculty of Dentistry (n=115), Faculty of Pharmacy (n=69), and Faculty of Physiotherapy (n=72) were invited to take part in the study, which was conducted at the conclusion of the 2023–2024 academic year. A total of 159 students completed the questionnaire. Demographic variables such as age, gender, academic

discipline, and anatomy course performance were recorded. For academic performance evaluation, all three faculties followed a comparable anatomy curriculum consisting of theoretical lectures and laboratory-based practical sessions. Assessment formats, including midterm and final examinations, were conducted using similar written exam structures across faculties. Anatomy performance was evaluated using percentage-based grading (0–100), which is standardized across all faculties at Kocaeli Health and Technology University. For the motivational factors relation to students' academic achievement evaluation, the Motivated Strategies for Learning

Questionnaire (MSLQ)—a validated and widely used tool adapted into Turkish by Altun and Erden—was employed to assess the relevant subscales.<sup>4,6,7</sup>

For scoring the MSLQ, students rated themselves on a 7-point Likert-scale from “not at all true of me” = 1 to “very true of me” = 7. Each motivation subscale score was reported as mean  $\pm$  SD. Reliability analysis of each motivation subscale was conducted and reported as Cronbach's alpha ( $\alpha$ ) previously by Altun and Erden (2007).<sup>8</sup> The six motivation subscales of the MSLQ are shown in Table 1.

**Table 1.** Subscales of the motivational strategies in learning.

Scale	Subscales	Items
<b>Motivational Beliefs</b>		
	Extrinsic Goal orientation	1, 16, 22, 24
	Intrinsic Goal Orientation	7, 11, 13, 30
	Task value	4, 10, 17, 23, 26, 27
	Control over learning beliefs	2, 9, 18, 25
	Self-efficacy	5, 6, 12, 15, 20, 21, 29, 31
	Test anxiety	3, 8, 14, 19, 28

All data were analyzed in SPSS statistical package, version 22 (IBM Corp., Armonk, NY) and reported descriptively. Mean values were calculated for the MSLQ subscales and analyzed using one-way ANOVA. Reliability and internal consistency for each of these subscales were examined with the use of Cronbach's  $\alpha$ . The normality of the variables was assessed using statistical tests, specifically the Kolmogorov-Smirnov. Descriptive analysis was used to determine the distribution of gender and faculty among the participants. For variables that showed normal distribution, parametric tests were used; for variables that did not meet the normality assumption, non-parametric tests were employed. In the comparison of two independent groups, tests based on the means or proportions of two independent

samples were applied. For the comparison of three or more independent groups, one-way analysis of variance (ANOVA) was used. Statistical significance was set at  $p < 0.05$ .

## Results

The questionnaire was completed by 159 students (Dentistry = 78, Pharmacy = 51, Physiotherapy = 30) with a total response rate of 63.3%. Age distribution of participants was as follows:  $n = 88$  (54.3%) were between 18-20 years old,  $n = 54$  (33.3%) were between 21-23 years old,  $n = 8$  (4.9%) were between 24-26 years old,  $n = 2$  (1.2%) were between 27-30 years old, and  $n = 7$  (4.3%) were over 30-year-old (Table 2).

**Table 2.** Distribution of demographic characteristics by gender and faculty.

		Frequency (n)	Percent (%)
<b>Gender</b>	<b>Female</b>	101	63.5
	<b>Male</b>	58	36.5
	<b>Total</b>	159	100
<b>Faculty</b>	<b>Dentistry</b>	78	49.1
	<b>Pharmacy</b>	51	32.1
	<b>Physiotherapy</b>	30	18.9
	<b>Total</b>	159	100

Based on the descriptive statistics and p-values for the subscale by gender, the analysis revealed that female students scored significantly higher. Significant differences were observed in subscales of test anxiety ( $p = 0.001$ ), intrinsic goal orientation

( $p = 0.008$ ), and task value ( $p = 0.037$ ) and total scale of motivational beliefs ( $p = 0.013$ ) with female students demonstrating higher mean values in these areas (Table 3).

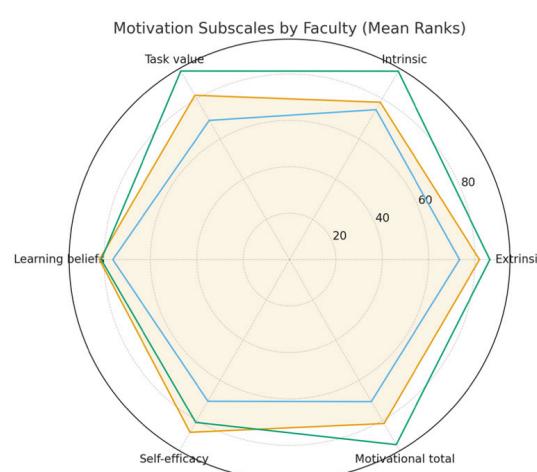
**Table 3.** Descriptive statistics and p-values for subscales by gender.

	<b>Gender</b>	<b>n</b>	<b>Mean</b>	<b>Std. Deviation</b>	<b>t</b>	<b>p</b>
<b>Extrinsic goal orientation</b>	Female	101	19.71	4.186	1.689	0.094
	Male	58	18.57	4.066		
<b>Self-efficacy for learning and performance</b>	Female	101	39.76	9.395	0.589	0.557
	Male	58	38.88	8.572		
<b>Test anxiety</b>	Female	101	23.36	6.398	3.336	<b>0.001*</b>
	Male	58	19.79	6.633		
<b>Motivational beliefs (Total)</b>	Female	101	160.11	26.800	2.510	<b>0.013*</b>
	Male	58	149.38	24.386		
	<b>Gender</b>	<b>n</b>	<b>Mean Rank</b>	<b>Sum of Ranks</b>	<b>z</b>	<b>p</b>
<b>Intrinsic goal orientation</b>	Female	101	87.28	8815.50	-2.638	<b>0.008*</b>
	Male	58	67.32	3904.50		
<b>Task value</b>	Female	101	85.77	8663.00	-2.089	<b>0.037*</b>
	Male	58	69.95	4057.00		
<b>Control over learning beliefs</b>	Female	101	82.36	8318.00	-0.855	0.393
	Male	58	75.90	4402.00		

\* $p < 0.05$

Table 4 compares motivation subscales across students from different faculties. Test anxiety was analyzed using parametric tests. Although no statistically significant differences were found among

the groups, physiotherapy students consistently scored the highest across subscales, particularly in test anxiety (Figure 1).



**Figure 1.** Comparison of motivation subscale mean ranks among health profession students using a radar plot. The six MSLQ motivation subscales—extrinsic goal orientation, intrinsic goal orientation, task value, control of learning beliefs, self-efficacy, and total motivational beliefs—are displayed for Dentistry ( $n = 78$ , blue line), Pharmacy ( $n = 51$ , orange line), and Physiotherapy ( $n = 30$ , green line) students. Physiotherapy students showed the highest mean ranks in intrinsic goal orientation and task value, suggesting stronger perceived relevance and personal engagement with anatomy learning. Pharmacy students demonstrated the lowest mean ranks across multiple subscales, while dentistry students displayed intermediate values. The plot visually summarizes interprofessional differences in motivational patterns.

**Table 4.** Motivation Subscales in Different Cohorts (Pharmacy, Physiotherapy, Dentistry) of Students

	<b>Faculty</b>	<b>N</b>	<b>Mean Rank</b>	<b>Kruskal-Wallis H</b>	<b>P</b>
<b>Extrinsic goal orientation</b>	<b>Dentistry</b>	78	81.92	1.798	0.407
	<b>Pharmacy</b>	51	73.31		
	<b>Physiotherapy</b>	30	86.38		
<b>Intrinsic goal orientation</b>	<b>Dentistry</b>	78	78.26	3.511	0.173
	<b>Pharmacy</b>	51	74.58		
	<b>Physiotherapy</b>	30	93.75		
<b>Task value</b>	<b>Dentistry</b>	78	81.71	5.598	0.061
	<b>Pharmacy</b>	51	69.26		
	<b>Physiotherapy</b>	30	93.82		
<b>Control over learning beliefs</b>	<b>Dentistry</b>	78	82.00	0.515	0.773
	<b>Pharmacy</b>	51	76.23		
	<b>Physiotherapy</b>	30	81.22		
<b>Self-efficacy for learning and performance</b>	<b>Dentistry</b>	78	85.89	3.503	0.174
	<b>Pharmacy</b>	51	70.42		
	<b>Physiotherapy</b>	30	80.97		
<b>Motivational beliefs (Total)</b>	<b>Dentistry</b>	78	81.53	4.267	0.118
	<b>Pharmacy</b>	51	70.59		
	<b>Physiotherapy</b>	30	92.03		
<b>Test anxiety</b>			<b>Mean</b>	<b>F</b>	<b>P</b>
	<b>Dentistry</b>	78	21.49	1.048	0.353
	<b>Pharmacy</b>	51	22.04		
	<b>Physiotherapy</b>	30	23.57		

\*p&lt;0.05

**Table 5.** Motivation Subscales and Anatomy Performance.

	<b>Anatomy Performance (Grade)</b>	<b>N</b>	<b>Mean Rank</b>	<b>Kruskal-Wallis H</b>	<b>P</b>	<b>Group where the difference originates</b>
Extrinsic goal orientation	0-50	47	68.49	6.229	<b>0.044*</b>	<b>[0-50] &lt; [70-100] p=0.040</b>
	51-70	53	78.30			
	70-100	59	90.69			
Intrinsic goal orientation	0-50	47	79.22	0.023	0.989	
	51-70	53	80.60			
	70-100	59	80.08			
Task value	0-50	47	73.95	2.905	0.234	
	51-70	53	76.48			
	70-100	59	87.98			
Control over learning beliefs	0-50	47	70.98	2.584	0.275	
	51-70	53	83.56			
	70-100	59	83.99			
Motivational beliefs (Total)	0-50	47	69.49	5.277	0.071	
	51-70	53	78.25			
	70-100	59	89.94			
Test anxiety	0-50	47	86.21	1.341	0.511	
	51-70	53	75.78			
	70-100	59	78.84			
Self-efficacy for learning and performance	<b>Mean</b>	<b>Std. Deviation</b>		<b>F</b>	<b>P</b>	
	0-50	47	35.53	7.765	<b>0.001*</b>	<b>[0-50]&lt;[51-70] p=0.014 [0-50]&lt;[70-100] p=0.000</b>
	51-70	53	39.87			
	70-100	59	42.17			

\*p&lt;0.05

Table 5 presents the relationship between motivation subscales and anatomy performance, categorized by grade ranges (0-50, 51-70, and 71-100). A positive but weak correlation was found between motivation scores and academic performance, with significant differences observed in goal orientation and learning beliefs across different grade categories. Students scoring between 0-50 had the Intrinsic Goal Orientation and highest test anxiety, while those with grades above 50 showed higher self-efficacy and learning beliefs. Self-efficacy was found to be significantly higher in students with better academic performance, as indicated by ANOVA results.

## Discussion

This study examined the motivational profiles of students from dentistry, physiotherapy, and pharmacy programs and explored how these factors relate to anatomy performance. Overall, the results support earlier findings reporting that motivation—particularly self-efficacy, task value, and goal orientation—plays an important role in academic achievement in the health sciences.<sup>3,4,9-13</sup> Although

the correlation between motivation and performance in our sample was weak, it was consistent and in the expected direction: students who believed more strongly in their ability to learn and who valued the course tended to perform better in anatomy. This aligns with previous reports highlighting self-efficacy as one of the most reliable predictors of success in preclinical subjects.

Our faculty-based comparisons showed a pattern in which physiotherapy students scored higher on several motivational subscales, especially task value and intrinsic goal orientation. While these differences did not reach statistical significance, the descriptive trend is similar to previous reports suggesting that learners whose professional education is grounded in musculoskeletal and functional anatomy often demonstrate stronger engagement with the subject.<sup>10-13</sup> Abdel Meguid and colleagues<sup>3,4</sup> also noted that intrinsic motivation and self-efficacy drive students' performance in anatomy courses, and our findings follow the same direction. Unlike the study by Zilundu et al.,<sup>13</sup> which did not find meaningful links

between motivation and anatomy performance, our results suggest that motivational beliefs do have some influence on grades, although the effect appears modest.

The MSLQ has been widely used to examine student regulation of learning and remains a suitable tool for identifying motivational patterns in anatomy education.<sup>9-11</sup> Our findings add to this body of work by providing an interprofessional comparison of three different health programs within the same institution, offering insight into how curricular differences may shape motivation.

The higher motivational scores among physiotherapy students may be related to the structure of their curriculum and the way anatomy is positioned within their training. Physiotherapy students routinely use detailed anatomical knowledge in biomechanics, kinesiology, and rehabilitation practice; therefore, the relevance of anatomy to their future clinical work is apparent from the beginning of their education. This direct connection may naturally enhance task value and foster stronger intrinsic motivation compared with programs where anatomy is one of several foundational sciences, such as pharmacy.

Gender differences also emerged in our data. Female students reported higher intrinsic goal orientation, task value, and test anxiety than male students. While stronger goal orientation and higher perceived value of the course are typically associated with deeper learning approaches, elevated test anxiety may hinder performance by affecting concentration and confidence. This mixed profile is not unusual in the literature and has been observed in other health science programs. It suggests that although female students may be highly driven, they may also experience more academic pressure. This shows the need for targeted support strategies that address both motivation and anxiety.

The modest strength of the correlation between motivation and anatomy grades indicates that motivation alone does not determine academic success. Other factors such as prior knowledge, learning strategies, time management, and the difficulty level of assessments, likely interact with motivation to shape performance. Still, motivation remains a modifiable factor that educators can influence through well-designed learning environments.

The findings suggest several practical implications for anatomy teaching. Cadaveric dissection was

considered as the "gold standard" for anatomy teaching since the 17th century.<sup>14</sup> Although, as virtual reality, 3D models, and online platforms have become more common in continuing anatomy education<sup>15-18</sup>, the learning methods also altered. This variability in student performance, as noted in the literature<sup>14-16</sup> raises an important question: how well can students adapt to newly established technological methods<sup>16-20</sup> compared to traditional dissection, and how quickly can faculty adapt to these emerging tools? Recent literature suggests that the integration of metacognitive strategies and technological platforms may be most effective when combined with strong motivational scaffolds.<sup>19,20</sup> First, reinforcing the clinical relevance of anatomy; especially for pharmacy and dentistry students; may help increase task value. Case-based learning, short clinical scenarios, and discipline-specific examples may support students in understanding why anatomy matters for their future practice.

Second, the levels of test anxiety observed in some student groups, particularly females and physiotherapy students, shows the need for assessment designs that reduce performance pressure. Regular low-stakes quizzes, short formative assessments, and opportunities for structured practice can help students monitor their progress without the fear associated with high-stakes exams. Peer-assisted learning sessions led by senior students may also help normalize the learning process and create a supportive atmosphere. Feedback-focused sessions after exams, where students receive clear explanations of their strengths and areas for improvement, can build confidence and improve self-regulated learning.

This study has several limitations. First, it was conducted at a single institution, which may limit the generalizability of the findings. Second, the use of self-reported questionnaires introduces the possibility of response bias, as students may overestimate or underestimate their motivations. Third, the sample sizes differed across faculties, which may influence comparative analyses. Although our overall sample size (N = 159) provides adequate statistical power ( $\approx 0.80$ ) to detect moderate effect sizes, a post-hoc analysis indicated that the study was underpowered to detect very small differences between faculties. Therefore, our non-significant findings for between-faculty comparisons should be interpreted with caution, as the study was not sufficiently powered to detect small effect sizes. Finally, the cross-sectional design does not allow the evaluation of how motivation evolves throughout

the academic year or across different phases of professional training. Future studies should consider multi-center or longitudinal designs to track how motivation evolves throughout the academic year and across different stages of professional training. Including additional variables; such as workload, prior academic performance, mental health factors, and students' perceptions of assessment fairness. This could also help build a more comprehensive understanding of what drives anatomy success.

### **Conclusion**

The study demonstrated that motivation subscales play a critical role in the academic success of health profession students studying anatomy. Female students showed higher levels of test anxiety, intrinsic goal orientation, and task value compared to male students. Physiotherapy students scored higher in motivational subscales, particularly in test anxiety, although these differences were not statistically significant. This study showed that improving students' self-efficacy and motivation could potentially improve their academic performance, too. The findings show the need for targeted interventions that address test anxiety, boost self-efficacy, and

foster positive learning beliefs. Further studies with interventions and longitudinal evaluations could improve anatomy education outcomes and overall academic achievement in health profession programs.

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### **Ethics approval**

The ethical approval for this study was granted from the Kocaeli Health and Technology University Non-invasive Clinical Research Ethics Committee (Project No: 2024-76).

### **Conflict of Interest**

The authors declare no conflicts of interest regarding the subject matter or materials discussed in this article.

### **Authorship Contributions**

Idea/Concept: M.S.M Design: M.S.M Control/Supervision: M.S.M, M.Ö Literature Review: M.S.M, M.Ö Data Collection and/or Processing: M.Ö Analysis and/or Interpretation: M.Ö Writing the Article: M.S.M, M.Ö Critical Review: M.S.M, M.Ö.

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