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ARAŞTIRMA YAZISI / RESEARCH ARTICLE

İNTERM FİZYOTERAPİ ÖĞRENCİLERİNİN ANATOMİ BİLGİ SEVİYESİNİN OMUZ PROBLEMLİ HASTALARIN TEDAVİSİ ÜZERİNDEKİ ETKİSİ

THE EFFECT OF ANATOMY KNOWLEDGE LEVEL OF INTERN PHYSIOTHERAPY STUDENTS ON THE TREATMENT OF PATIENTS WITH SHOULDER PROBLEMS

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ÖZET

AMAÇ: Çalışmanın amacı, fizyoterapi stajyer öğrencilerinin omuz kısıtlılığı hastalarının tedavisindeki başarısını ve bu yeterliliğin üst ekstremite anatomisi bilgisi ile ilişkisini belirlemektir.

GEREÇ VE YÖNTEM: Üst ekstremite anatomi sınavına 48 stajyer öğrenci alındı. 1. Grupta 45 puanın altında puan alan 20 öğrenci, 2. Grupta ise 45 puanın üzerinde puan alan 28 öğrenci yer aldı. 48 hastaya 4 hafta boyunca, haftalık 5 seans, standart parmak merdiveni ve sopa egzersizleri uygulandı. Hastalara ayrıca kontrol ölçümlerine kadar ev egzersizleri öğretildi. VAS (dinlenme, aktivite, uyku), omuz hareket açıklığı (EHA), SF-36 (sağlık anketi anketi), kol, omuz ve el sakatlığı anketi (DASH) ve hasta memnuniyet anketi (PSQ-18) tedavi öncesi, tedavi sonrası (PostT) ve tedaviden 4 hafta sonra (C) gerçekleştirildi.

BULGULAR: Grup 2'deki hastalarda kısa periyotta (PostT) VAS, ROM ve DASH'de istatistiksel olarak anlamlı iyileşme belirlendi. Uzun dönemde (C) her iki gruptaki hastalarda istatistiksel olarak anlamlı iyileşme olduğu ve gruplar arası bir üstünlük olmadığı belirlendi. Grup 2'deki hastalarda kısa periyotta (PostT) ve uzun periyotta (C), SF-36 değerlendirmesinde istatistiksel olarak anlamlı artış gözlenirken, Grup 1'de bu artış yoktur. PSQ-18'de her iki gruptaki hastalarda istatistiksel anlamlı fark gözlenirken, gruplar arasında anlamlı farklılık yoktur.

SONUÇ: Fizyoterapi stajyer öğrencilerinin üst ekstremite anatomisine ilişkin yeterli bilgi sahibi olmaları kısa periyotta etkili olmaktadır. Hastaların uzun periyotta ev egzersizlerine düzenli olarak devam etmesi, anatomi bilgisi eksikliğinden kaynaklanan tedavi kalitesinin düşüklüğünü azaltmaktadır.

ANAHTAR KELİMELER: Anatomi, Fizyoterapistler, Omuz ağrısı, SF-36, PSQ-18.

ABSTRACT

OBJECTIVE: The study aims to determine the success of physiotherapy intern students in treating patients with shoulder disabilities and to investigate the relationship between this competence and their knowledge of upper extremity anatomy.

MATERIAL AND METHODS: 48 intern students were taken to the upper extremity anatomy exam. 20 students scored below 45 points formed Group 1, 28 students scored above 45 points formed Group 2. Standard finger ladder and wand exercises were applied to 48 patients 5 weekly sessions for 4 weeks. Patients were also taught home exercises to continue until the follow-up sessions. VAS (rest, activity, sleep), shoulder range of motion (ROM), SF-36 (health survey questionnaire), the disability of the arm, shoulder, and hand (DASH), and patient satisfaction questionnaire (PSQ-18) were performed pre-treatment, post-treatment (PostT), and 4 weeks after the treatment (C).

RESULTS: In the short term, statistically significant improvement has been determined in VAS, ROM, and DASH in patients in group 2. In the long term, there was a statistically significant improvement in patients in both groups and no intergroup superiority. There was a statistically significant increase in SF-36 in the short and long periods in patients in Group 2, while no such increase was observed in Group 1. In PSQ-18, patients in both groups showed statistically significant satisfaction, with no significant differences between the groups.

CONCLUSIONS: Adequate knowledge of upper extremity anatomy of physiotherapy intern students is effective in achieving short-term treatment success. In the long term, patients' regular continuation of home exercises reduces the lack of treatment quality due to lack of anatomy knowledge.

KEYWORDS: Anatomy, Physical therapists, Shoulder pain, SF-36, PSQ-18.

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INTRODUCTION

Physiotherapists provide, maintain, and restore maximum movement and functional abilities throughout their lives, aiming to regain functions that have decreased due to various diseases, injuries, and advancing ages (1). Human anatomy in physiotherapy education is one of the most essential courses that should be given to physiotherapists within the scope of basic sciences (2). Anatomy, the oldest science that examines the normal shape, structure, position, functions, and the relationship between the structures that form the human body, is very valuable for physiotherapists regarding clinical evaluation, treatment effectiveness, and safe practice (3).

The prevalence of shoulder pain in the general population is 67% (4). Hodgetts and Walker (5) reported that only half of shoulder pain patients recover within 6 months. The result of shoulder pain is often a reduction in the range of shoulder joint movement. This decrease leads to a decrease in functional competence (6).

It is always important to improve the quality and efficiency of education and to overcome the deficiencies. For this reason, evaluating the success results of student education based on feedback is one of the frequently used methods to improve education (7).

The aim of the study was to determine the effect of adequate anatomical knowledge in physiotherapy education on physiotherapy applications in the treatment of patients with shoulder ROM limitation and to fill the gap in the literature regarding the importance of anatomy education in physiotherapist education.

MATERIAL AND METHODS

Subject

All participants were informed about the shoulder rehabilitation treatment and were assured that they could withdraw from the study at any time without providing a reason. The informed consent form was taken from the patients. They were informed that patient confidentiality would be protected, that they would not be shared with anyone outside the study, that research records would only be kept by the study conductor, and that there would be no other research records. Demographic data, including gender, age, height, weight, BMI, affected side, medication use, and chronic disease history were recorded. A physical medicine and rehabilitation doctor diagnosed the volunteer patients. Inclusion criteria were had limitations in ROM of the affected shoulder, being between 25-75 years of age, being mentally competent to understand the explanations, not having received medical or conservative treatment in the last 3 months, having shoulder pain persisting for more than 3 months, and reporting a morning VAS score of at least 2 points. Exclusion criteria included previous physiotherapy, corticosteroids, prolotherapy, PRP, invasive procedures, arthroscopy, or surgery on the patient's shoulder. Patients with rheumatologic diseases (RA, AS, Psoriatic Arthritis, etc.), diabetes mellitus, metabolic syndrome, advanced cardiometabolic diseases, endocrine diseases, or cancer were excluded. Our study included 12 patients with adhesive capsulitis and 36 patients with rotator cuff tears.

Sample size

The minimum sample size required to detect a significant difference using this test should be at least 24 in each group, (48 in total), considering type I error (alfa) of 0.05, power (1-beta) of 0.8, effect size of 0.84 and two-sided alternative hypothesis (H1).

Treatment Procedure

To assess the anatomy knowledge of the upper extremity, an anatomy exam focusing on upper extremity questions was applied to the final year undergraduate students beginning their practical internship training in the physical therapy department **(Table 1)**.

Table 1: Examination questions administered to students

Query number	Exam questions (each question and blanks are 5 point)
1	Write the name of the muscle that causes internal rotation of the arm from the rotator cuff muscles.
2	Write the muscles under the spina scapula that allow external rotation of the arm from top to bottom.
3	Write the muscles that make the 90-180 degree movement of the shoulder abduction movement.
4	Write the muscle that is one of the muscles of the anterior group of the arm and does not have origin from the scapula.
5	Write the bones that make up the glenohumeral joint.
6	Cubital tunnel syndrome is caused by entrapment of which nerve in the elbow region?
7	Which muscle of the wrist is attached to the lateral epicondyle?
8	The brachial plexus is formed by the union of the anterior branches of which levels?
9	What is the nerve in the palmar region of the hand that receives the sensation of the first 3.5 (half of the 1st, 2nd and 3rd) fingers?
10	What is the nerve of the muscle, also known as the boxer's muscle, which protracts the shoulder, starting from the anterolateral surface of the upper costae?
11	The muscle that is lesioned in torticollis is called the ..... the nerve of this muscle is the ..... nerve, which is also cranial nerve number .....This nerve is also the nerve of the .....muscle, which adducts and upward rotates the scapula.
12	What are the nerves that provide motor innervation of the forearm?
13	If the muscle in the middle part of the shoulder atrophies and the patient cannot maintain abduction, which nerve is suspected of denervation or entrapment?
14	When a patient presents with burning in the hands at night and numbness in the first 3.5 fingers of the hand, we suspect entrapment of the.....nerve. Clinically, this condition is called .....
15	What is the strongest supinator muscle of the wrist?

The students' exams were evaluated by four experts consisting of two expert anatomists and two expert physiotherapists and categorized into two groups: students with a grade below 45 (group 1) and students with a grade above 45 (group 2). For the randomization of the patients, 48 folded cards with the interns' names were prepared and placed in opaque envelopes. The department's manager physiotherapist randomly selected an envelope and assigned the patient to the intern who came out of the envelope. The groups were categorized according to the interns' anatomy scores. Care was taken to include the patients participating in the study in a balanced demographic and clinical manner. All trainers determined by randomization were informed that they should apply what they learned in the patient's treatment and that the patient's values would be measured after treatment and in control evaluations. Then, the standard treatments were applied 5 times a week for 2 weeks in the physical therapy department. The exercises performed in the hospital and home exercises were controlled by the supervisor physiotherapist. Care was taken to ensure that the intensity and duration of the exercises were applied to all patients as standard. Treatment was stopped if the patient had severe side effects, chose to withdraw, or used unapproved medications **(Figure 1)**.

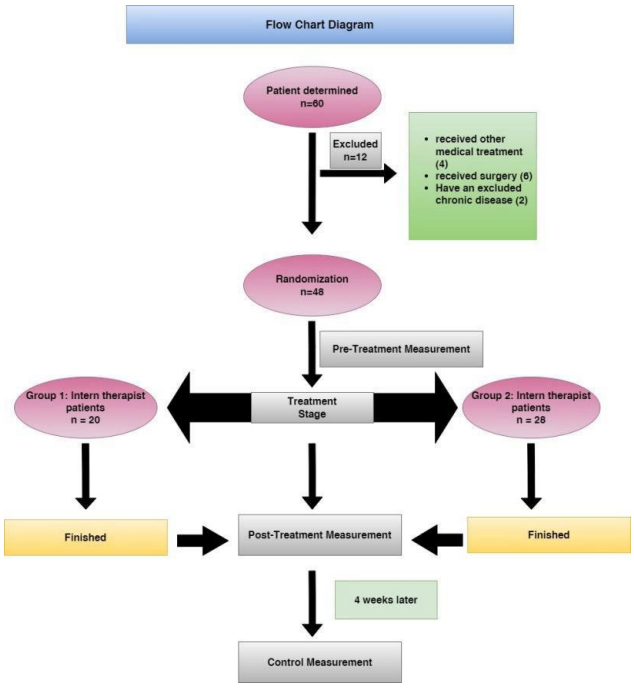

Figure1: Flow chart diagram

Treatment Protocole

In both groups, wand and finger ladder exercises, commonly used in classical shoulder treatment, were applied. Patients were taught these exercises, which were given to them as home exercises. Then, they were followed up until the control session.

Wand exercises: The entire wand exercises program consisted of standing exercises with a 770-gram wand Including 10 motions of the upper and lower limbs. Shoulder motions include flexion-extension, abduction-adduction, internal-external rotation, movements of the shoulders (8). The exercise was performed in 3 sets, including all movements, and accompanied by an intern physiotherapist **(Figure 2)**.

Finger ladder exercises: In this exercise, the patient is in a standing position, facing the ladder hanging on the wall and standing on the side. The patient is asked to place his/her hand on a low level of the ladder and slowly climb the ladder with his/her fingers until he/she reaches the endpoint. Asked to wait a while at the endpoint, then slowly return to the starting point (9). This exercise was performed in 3 sets, including ascending and descending, under the supervision of an intern physiotherapist **(Figure 2)**.

Figure 2: Wand and finger ladder exercises (A. Flexion B. Extansion C. Abduction-adduction D. İnternal-external rotation E. Flexion-extansiyon F. Abduction-adduction)

Outcome measures

Demographic data of the patients were recorded. VAS, upper extremity functionality questionnaire (DASH), quality of life scale (SF36- short form), and shoulder range of motion were evaluated pre-treatment, post-treatment, and 1 month after the end of treatment (control outcome). In the control session, the PSQ-18 patient satisfaction questionnaire short form was additionally administered by an independent expert not involved in the treatment.

VAS: Patients were asked to place a mark along a 10 cm horizontal line. indicating their level of pain at rest, during activity, and during sleep. The distance from the point to the starting point was measured with a ruler and the degree of pain was determined. In this rating, a score of 0 indicates "no pain" and 10 indicates "worst pain". The reliability of the VAS for disability is moderate to good (10).

SF 36: It was developed by the Boston Institute of Health Research and is a 36-item health-related survey that assesses overall quality of life and it is a short method of checking and assessing the health status of individuals in the general population (11). On all subscales, an average score of 50 and above represents a better state of health in physical and mental measurements (12). It is easy to perform, acceptable to patients, and fulfills stringent criteria of reliability and validity (13).

DASH: It is a questionnaire designed to measure physical function and symptoms in people with upper extremity musculoskeletal disorders. It consists of 30 items: 6 items related to symptoms and 24 related to functioning. The questions are administered on a 5-point Likert scale, and the cumulative score ranges from 0 to 100, with higher scores indicating greater disability (14).

Shoulder range of motion assessment: Shoulder flexion, extension, abduction, adduction, internal rotation, and external rotation range of motion values adapted for adults using American Academy of Orthopaedic Surgeons values (15).
PSQ-18 Short form patient satisfaction questionnaire: This Likert-scale questionnaire includes seven dimensions of patient satisfaction with the healthcare team and their doctors. Overall satisfaction, technical quality, communication, financial aspects, interpersonal relations, accessibility, time spent with the doctor, and convenience are evaluated in this form. The higher the score, the lower the level of satisfaction (16).

Ethical Committee

This randomized study was conducted on 48 adult patients admitted to Malatya Training and Research Hospital between May 2022 and August 2022, with the approval of Malatya Turgut Ozal University Clinical Research Ethics Committee (2022/20).

Statistical Analysis

Qualitative data from the variables included in the study were summarized with a number (percentage). The conformity of quantitative data to normal distribution was evaluated by the Shapiro-Wilk test. Data not normally distributed were summarized as median (minimum-maximum), and normally distributed data were summarized as mean± standard deviation. Mann-Whitney U test and Friedman test were used in statistical analyses where appropriate. A value of $p<0.05$ was considered statistically significant. All analyses were performed using IBM SPSS Statistics 26.0 for Windows (New York, USA).

RESULTS

There was no statistical difference between the number of female and male patients in the groups (p=0.208). There was no statistical difference between the median (min-max) age of female and male patients in the groups (p=0.789, p=0.839) **(Table 2-4)**.

Table 2: Demografic characteristics

Demografic parameters		Group 1	Group 2	p
Gender	Female n(%)	16 (47.1)	18 (52.9)	0.208*
	Male n(%)	6 (42.9)	8 (57.1)	
	Median(Min-Maks)			
Age	Female	52(40-60)	53(29-69)	0.789**
	Male	56(25-72)	57(38-66)	0.839**

Min: Minimum; Max: Maximum; *: Fisher's exact-square test, **: Mann Whitney U test

Table 3: Descriptive statistics of quantitative variables of patients

Variables	Mean±SD	Median (Min-Max),
Age	53.04±9.86	52.5(25-72)
Height	164.73±8.72	162.5 (150-185)
Kg	78.56±13.35	77.5 (57-105)
BMI	29.03±4.94	28.653 (20.911-40.009)

SD: Standart Deviation;Min: Minimum; Max; Maximum

Table 4: Distribution of qualitative variables of the patients

Variables		Count (n)	Percentage (%)
Gender	Female	34	70.8
	Male	14	29.2
Dominance extremity	Rigt	30	62.5
	Left	18	37.5
Chronic disease	Yes	29	60.4
	No	19	39.6
Medical drug usage	Yes	28	58.3
	No	20	41.7
Pain duration	0-3 monts	10	20.8
	3-6 monts	17	35.4
	6-12 monts	9	18.8
	Less than 1 year	12	25.0
Groups	Group 1 (Below average)	20	41.7
	Group 2 (Upper average)	28	58.3

VAS outcomes: According to VAS resting, VAS activity and VAS sleep evaluations, the decrease in pre-treatment to post-treatment (PreT-PostT) values in Group 2 was statistically significant compared to Group 1 (p<0.05)**(Table 5)**.

Table 5: Outcomes of the evaluations

Parameters	Group 1			p^*	Group 2			p^*
	PreT	PostT	C		PreT	PostT	C	
VAS								
Rest	6.5[b](0-10)	2.5(0-6)	1(0-4)	**0.001**	5[a,b](0-10)	3(0-8)	2(0-9)	**<0.001**
Activity	7[b](2-10)	4(1-7)	2(0-4)	**0.001**	8[a,b](0-10)	4(0-10)	3(0-11)	**<0.001**
Sleep	6.5[b](0-10)	2(0-9)	1(0-8)	**0.002**	8[a,b](0-10)	4.5[b](0-8)	2(0-8)	**<0.001**
Range of motions of shoulder								
Flexion	107[b] (20-150)	135(45-180)	155(47-180)	**0.001**	110[a,b] (19-165)	142.5 (27-180)	150 (50-180)	**<0.001**
Extansion	30[a,b](10-40)	40(26-60)	45(30-60)	**0.001**	40[a,b] (10-70)	45(15-90)	50 (20-90)	**<0.001**
Abduction	77[b](15-130)	98(25-160)	115(30-170)	**0.003**	92.5[a,b] (25-170)	130 (30-180)	130 (45-180)	**<0.001**
Adduction	20(10-40)	31(20-45)	37(20-45)	**0.51**	25[a,b] (10-45)	30[b](14-45)	35 (15-50)	**<0.001**
Internal rotation	50[b](10-65)	60(30-80)	62.5(38-90)	**0.007**	37.5[a,b] (0-90)	52.5(5-90)	50 (10-90)	**0.001**
External rotation	27[b](0-50)	37.5(15-90)	47.5(15-90)	**0.001**	47.5[a,b] (0-90)	70(0-90)	67.5 (10-90)	**<0.001**
SF-36								
Physical function	60(0-95)	72.5(25-95)	82.5(55-95)	0.094	55[a,b] (10-90)	75 15-100)	80 (35-100)	**<0.001**
Physical role difficulty	0(0-100)	50(0-100)	50(0-100)	0.051	0[b] (0-100)	25(0-100)	37.5 (0-100)	**<0.001**
Emotional role difficulty	0(0-100)	49.97(0-100)	49.92(0-100)	0.368	0[b] (0-100)	33.32 (0-100)	33.32 (0-1000)	**<0.001**
Energy/ Life/ vitality	45(15-70)	60(45-75)	60(5-80)	0.056	30[a,b] (0-80)	45(0-100)	47.5 (0-100)	**<0.001**
Spiritual Health	58(28-82)	56(32-84)	64(32-96)	0.538	56[a,b] (12-100)	60 (20-100)	66 (20-100)	**<0.001**
Social functioning	75 (12.5-100)	68.75 (50-100)	68.75 (50-100)	0.268	60[a,b] (0-100)	68.75 (12,5-100)	75 (25-100)	**<0.001**
Pain	41.25 (0-67.5)	50 (45-67.5)	67.5 (45-90)	0.051	23.75[a,b] (0-77.5)	57.5 (10-100)	62.5 (0-90)	**<0.001**
General Health Perception	47.5 (0-80)	62.5 (10-80)	67.5 (15-85)	0.051	40[a,b] (10-90)	50 (10-100)	45 (10-100)	**<0.001**
DASH								
DASH	706.25[b] (281-843)	384.38 (256-600)	293.75 (231-475)	**0.001**	634.38[a,b] (268-881)	415.63[b] (181-800)	375 (162-693)	**<0.001**

In both groups, there was a significant difference between the pre-treatment and control session (PreT-C) in all three VAS evaluations. In addition, there was no statistically significant superiority in intergroup comparisons (p>0.05) (Table 5).

ROM outcomes: The increase in ***shoulder flexion*** ROM was superior in group 2 in the period between PreT-PostT (p<0.05). In PreT-C outcomes, there was a significant increase in both groups (p<0.05). There was no superiority between the groups (p>0.05) (Table 5). There was a significant ROM increase in ***shoulder extension*** and ***shoulder abduction*** in both groups in the PreT-PostT (except for shoulder abduction group 1) and PreT-C periods (p<0.05). There was no statistically significant difference in the intergroup superiority assessment (p<0.05) (Table 5). There was a significant ROM increase in shoulder adduction at all periods in Group 2, and there was a statistical superiority to Group 1 (p<0.05) (Table 5).

There was a significant ROM increase superiority in Group 2 at internal and external rotation of the shoulder in the PreT-PostT period (p<0.05). There was a significant ROM increase in both groups in the PreT-C period (p<0.05); there was no statistically significant difference between each other (p<0.05) (Table 5). Finally, in ROM assessments, patients in Group 2 during the PreT-TS interval showed statistically significant increases in shoulder movements (p<0.05). In the PreT-C period, except for adduction movement, there was no statistically significant difference between the groups (p>0.05) (Table 5).

SF-36 outcomes: There was no statistically significant difference in group 1 in all sub-steps of SF-36 treatment periods, but there was in group 2 in treatment periods (p<0.05) (Table 5).

DASH outcomes: In the DASH outcomes, Group 2 was statistically superior to Group 1 in the PreT-PostT period (p<0.05). There was a statistically significant improvement in both groups in the PreT-C period (p<0.05) but no statistically significant difference in the intergroup assessment (p>0.05) (Table 5).

PSQ-18 outcomes: In the PSQ-18 patient satisfaction questionnaire outcomes, the patients in both groups were satisfied with the treatments, and there was no statistically significant difference between the groups in all the scale sub-steps (p>0.05) (Table 6).

Table 6: Outcomes of PSQ-18

PSQ-18	Group 1	Group 2	p^*
General satisfaction	4.5(2-5)	4.5(2.5-5)	0.909
Technical quality	4.5(2.75-5)	4.375(1.25-5)	0.989
Interpersonal attitude	5(4-5)	5(1-5)	0.135
Communication	4.5(2.5-5)	4.5(1.5-5)	0.815
Financial dimension	4.25(3-5)	4(1-5)	0.711
Time Spent	4.75(3-5)	4.25(3-5)	0.870
Accessibility and comfort	4.25(2.75-5)	3.5(2-5)	0.187

Data are given as median (minimum–maximum).*: Mann Whitney U test

DISCUSSION

In this study, we determined the significant improvement in group 2 patients at the short period (PreT-PostT) in pain decrease, shoulder ROMs, and upper limb function (DASH) evaluations, while there was a significant improvement in patients in both groups in the long period (PreT-C) and there were no statistically significant intergroup differences. In the quality of life assessment of patients (SF-36), there was a statistical significance in the short and long periods in Group 2, while there was no statistically significant increase in Group 1. On the Patient Satisfaction Questionnaire (PSQ-18), patients in both groups were satisfied with the physicians and the hospital, and there was no statistically significant difference between the groups. In the evaluation of the patient's range of motions in our study, it was determined that Group 2 showed a significant increase compared to the patients in Group 1, except for the shoulder adduction and shoulder flexion values. We think that the reason why there was no increase in shoulder adduction movement in group 1 was that it was a movement towards the mid-plane of the chest in direct proportion and that it did not work efficiently. Indeed, the same movement produced a significant difference in group 2 patients. We think that the fact that no significant difference was observed in the PreT-PostT evaluation of shoulder flexion movement in Group 1 is due to the same reason and that this situation is due to the difference in anatomy knowledge between the groups.

In the literature, anatomy education is effective in improving the quality of health professionals, such as nursing and physiotherapy students. Hirose et al. (17) reported that knowledge of anatomy and physiology is essential for practical applications in intern nursing students. Torrance et al. (18) reported that anatomy and physiology education is essential in understanding a person, in nursing practice, and especially in clinical decision-making. Phillips et al. (19) reported that the development of physiotherapy students' training in anatomical approaches such as processus spinosus shape and length in manual examination training increases the accuracy in determining the location of the relevant vertebra, and providing this simple anatomy information improves the ability of students to identify spine levels accurately. Therefore, simple anatomy information training should be provided to increase the accuracy of spine level. Downey et al. (20) and Harlick et al. (21) determine that spinal segmental levels require the knowledge of simple anatomical localization of the process spinous and the scientific verification of the segment is associated with knowledge of anatomy. In our study, the clinical reflection of anatomy education was quantitatively investigated, and it found that better results were obtained in the treatment of intern students who are proficient in upper extremity anatomy knowledge because patients continue their home exercises over a long period, significant results were obtained in both patient groups.

The literature includes studies indicating that anatomy education contributes to the student's occupational performance, critical thinking, observation, and patient safety. Jensen et al. (22) reported that students who understood the relationships between anatomy and physiology performed better in practical applications. Dilullo et al. (23) reported that anatomy contributes to students developing critical thinking and clinical reasoning skills. Fella et al. (24) stated that students contribute to patient observation, treatment choices, and patient safety with their anatomy education. Gordon et al. (25) stated that such areas constitute the basis of nursing practice. In contrast to these views, Davis et al. (26) reported that these courses are not compatible with their professions, based on the opinion of 40.5% of the students. In our study, we observed that during the exercise application of the intern students to the patient and the use of anatomical information, such as their approaches to the final angles of movements, the anatomy knowledge was reflected in the treatment and the patient's satisfaction. The significant results in both groups according to the satisfaction scale in the end-of-treatment evaluation show that anatomy is effective in the clinical approach to the patient, similar to the literature.

In the literature, we observe that anatomy education contributes to gaining patient trust and success in communication. Hirose et al. (17) re-

ported that nurses who relied on knowledge of anatomy and physiology gained the trust of the patient and his/her family, and knowledge of anatomy was essential for communication with multiple occupations. Van Wissen et al. (27) investigated the impact of anatomy and physiology education on the graduate level. They reported that this knowledge effectively developed confidence, especially in communication, practical, and clinical practice.

Studies stating that students have problems with confidence due to a lack of knowledge of anatomy support the literature. Craft et al. (28) reported that the students did not trust themselves in explaining the practices due to their lack of knowledge of anatomy and physiology and wanted to improve themselves on these issues. Similarly, Choi et al. (29) noted that a lack of knowledge of anatomy and physiology was an inability to conduct the nursing process and communicate with other health professionals. Our study determined that patient's satisfaction in both groups was high. This result is due to the motivation that develops due to the information that the patient's results will be evaluated and is reflected in the treatment.

We found that the fact that patients continue their home exercises during and after the treatment process and give importance to home exercises effectively improves the quality of treatment. As a result, we determined that physical therapy intern students, with adequate anatomical knowledge were significantly effective in patient recovery in over short periods such as after treatment. However, we have determined that the continuation of the home exercises of the patients in the long term reduces the lack of treatment quality that the lack of theoretical knowledge of anatomy can cause. Because of these inferences, we determined that there was improvement in both groups in the long period.

The limitation of the study was the timing of evaluations. The evaluation times could be in the same time interval because the pain sensitivity may alter at different time intervals of the day.

In conclusion, upper extremity anatomy education given to physiotherapy students in a quality manner is effective in a short period. Furthermore, we suggest that anatomy education be delivered during the final term. Further studies that evaluate the effectiveness of anatomy education on physiotherapy students' long-term results are needed in the literature. Moreover, regular adherence to home exercises over the long term compensates for the potential reduction in treatment quality due to insufficient anatomical knowledge.

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