Comparison of Physiotherapy and Rehabilitation Department Students in terms of Physical Activity Levels, Balance Levels and Muscle Endurance Values*

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Abstract

Aim: This study aims to compare the physical activity levels, balance levels and muscular endurance values of Physiotherapy and Rehabilitation students among grades. Thus, it will be determined to what extent students apply the knowledge they learned in the courses to their own lives.

Method: For the aim of our study, balance and trunk endurance, which are physical fitness parameters related to health, and physical activity levels were examined. Snowball randomization method was used in our study. 36 students (15 male, 21 female) volunteered to participate in our study. Y Balance Test was used for dynamic balance assessment, the Flamingo Balance Test for static balance assessment, the McGill Endurance Tests for endurance assessment, and the International Physical Activity Questionnaire for physical activity levels. SPSS 24.0 program was used in statistical analysis of data and significance value was accepted as $p<0.05$.

Results: There was no difference between groups of students included in the study in terms of age, body mass index and gender parameters ($p>0.05$). There was no statistically significant difference between groups in dynamic balance, static balance, all directions of endurance and physical activity levels ($p>0.05$). When

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the relationship between students' physical activity levels and balance–endurance values was examined, no significant relationship was found in any parameter (p>0.05) except for left-sided endurance (p<0.05).

Conclusion: As a result of our study, it was seen that there was no difference between degrees in terms of dynamic balance, static balance, endurance and physical activity levels of Physiotherapy and Rehabilitation students. When physical activity results were examined, it was seen that there were very few students in the inactive group. Based on this, we can say that Physiotherapy and Rehabilitation students are successful in applying the knowledge they learned in lectures in their own lives. We recommend increasing the number of participants in future studies.

Keywords: Dynamic balance, endurance, physical activity, physiotherapy students, static balance.

Fizyoterapi ve Rehabilitasyon Bölümü Öğrencilerinin Fiziksel Aktivite Düzeyleri, Denge Seviyeleri ve Kassal Endurans Değerleri Açısından Karşılaştırılması

Öz

Amaç: Bu çalışmanın amacı, Fizyoterapi ve Rehabilitasyon bölümü öğrencilerinin fiziksel aktivite düzeylerinin, denge seviyelerinin ve kassal endurans değerlerinin sınıflar arası karşılaştırmasının yapılmasıdır. Böylece öğrencilerin derste öğrendikleri bilgileri, kendi yaşamlarına ne derece uyguladıkları belirlenecektir.

Yöntem: Çalışmanın amacı doğrultusunda sağlık ile ilgili fiziksel uygunluk parametrelerinden olan denge ve gövde enduransı ile fiziksel aktivite düzeyleri incelendi. Çalışmamızda kartopu randomizasyon yöntemi kullanıldı. Çalışmaya katılmaya 36 öğrenci (15 erkek, 21 kadın) gönüllü oldu. Dinamik denge değerlendirmesinde Y Denge Testi, statik denge değerlendirmesinde Flamingo Denge Testi, endurans değerlendirmesinde McGill Endurans Testleri ve fiziksel aktivite düzeylerinin değerlendirilmesinde Uluslararası Fiziksel Aktivite Ölçeği kullanıldı. Verilerin istatistiksel analizde SPSS 24.0 programı kullanıldı ve anlamlılık değeri p<0,05 olarak kabul edildi.

Bulgular: Çalışmaya dâhil edilen öğrencilerin gruplar arasında yaş, vücut kütle indeksi ve cinsiyet parametreleri açısından fark yoktu (p>0,05). Gruplar arasında dinamik dengede, statik dengede, enduransın tüm yönlerinde ve fiziksel aktivite düzeylerinde istatistiksel olarak anlamlı fark bulunmadı (p>0,05). Öğrencilerin fiziksel aktivite düzeyleri ile denge ve endurans değerleri arasındaki ilişki incelendiğinde ise sol yönlü endurans hariç (p<0,05) hiçbir parametrede anlamlı ilişki bulunmadı (p>0,05).

Sonuç: Çalışmanın sonucunda Fizyoterapi ve Rehabilitasyon bölümü öğrencilerinin dinamik denge, statik denge, endurans ve fiziksel aktivite düzeyleri açısından sınıflar arası fark olmadığı görülmüştür. Fiziksel aktivite sonuçları incelendiğinde inaktif grupta çok az öğrenci olduğu görülmüştür. Buradan yola çıkarak Fizyoterapi ve Rehabilitasyon öğrencilerinin derslerde öğrendikleri bilgileri kendi hayatlarında uygulamada başarılı olduklarını söylenebilir. Gelecek çalışmalarda, katılımcı sayısının artırılması önerilmektedir.

Anahtar Sözcükler: Dinamik denge, endurans, fiziksel aktivite, fizyoterapi öğrencileri, statik denge.

Introduction

Physical activity is defined as all bodily movements (daily routine activities such as housework, shopping etc.) that result in energy expenditure[1]. Today, factors such as rapid urbanization, overcrowding of the population, increase in poverty and crime rates, traffic density, decrease in air quality, and inadequacy of sports and recreation areas negatively affect people's physical activity[2]. Physical activity is directly related to protection from non-communicable chronic diseases, increasing fitness, strengthening muscles and improving quality of life. It has been reported that one of the 10 leading risk factors for mortality in the world is insufficient physical activity[1]. Following the global impact of COVID-19, education in universities in Turkey, which was affected by the February 6 earthquakes, was carried out online for one semester. Students receiving online education attended courses from their own homes using devices such as phones, tablets or computers. This also contributes to the decrease in physical activity levels. There is also a positive relationship between physical activity and balance. As the level of physical activity increases, the level of balance also increases. Likewise, if the level of physical activity decreases, the level of balance also decreases[3].

The ability to balance is defined as keeping the whole body in a certain position and maintaining the situation during and after the body's displacement[4]. Control of balance is a complex motor skill that includes the planning and implementation of flexible movement patterns as well as the integration of sensory inputs. There are two types of balance, static and dynamic. Static balance is the skill that involves maintaining the position of the center of gravity in situations with little movement. Dynamic balance, on the other hand, can be thought of as providing or maintaining a certain position in certain movements or on unstable surfaces[5,6]. To achieve successful static and dynamic balance, muscular endurance needs to reach a certain level, in addition to other parameters essential for maintaining balance. A very important requirement for balance is trunk and upper extremity stabilization. Core stabilization is important to support loads, form the basis for upper and lower extremity movements, and protect the medulla spinalis and nerve roots. Günaydın and Eliöz state that people with good core stabilization strength have better static and dynamic balance[7].

The trunk works as the central connector of the lower and upper extremities as a stabilizer[8]. Stabilizer trunk muscles are activated before extremity movements and provide proximal stabilization in the formation of extremity movements[9]. Decreased muscle synergy in hip and trunk stabilizers together with poor trunk stabilization reduces performance in activities that require strength and increases the incidence of secondary injuries due to lack of control in the stabilizer trunk region[10]. While trunk muscle strength is important for maintaining daily life activities, trunk muscle endurance plays an important role in preventing injuries by providing stabilization of the spine during long-term physical activity and sports activities[11]. Although there are studies in the literature investigating the relationship between trunk muscle endurance and

static/dynamic balance in different populations, the results are contradictory[11-14]. In a study conducted on healthy male individuals, it was found that endurance measurements of trunk muscles (flexors, lateral flexors, extensors) were related to static balance[12]. Similarly, another study conducted in adolescent and young adult males showed a correlation between trunk flexor and extensor muscle endurance and one-leg standing test performance[11]. However, in the study conducted by Cobb et al. in healthy adults, the relationship between trunk muscle endurance, foot posture and lower extremity muscle strength and balance was investigated and it was concluded that trunk muscle endurance did not affect balance[13]. Additionally, in another study conducted on elite athletes, the relationship between trunk muscle endurance and hip muscle strength and balance was examined, and it was determined that hip muscle strength was more effective[14]. However, we know that if the endurance of the core area is not at a sufficient level, the balance will be negatively affected and the individual will be vulnerable to injury. It is necessary to consult a physiotherapist who is an expert in the field to create a personalized exercise program, increase the level of physical activity and balance, and improve muscle endurance.

Physiotherapy and Rehabilitation departments (PRD) are units that provide undergraduate education at international standards for 4 years to improve the health status and well-being of individuals and societies, to prevent diseases with treatment approaches and preventive health programs, and to increase the quality of life of individuals. PRD train health professionals who are experts in exercise and physical activity. Therefore, the students studying in this department are expected to apply the knowledge they have acquired in their own lives first.

When the literature is examined, although there are studies investigating physical activity levels, balance levels and muscular endurance values on PRD students, we have not found a study comparing PRD students in terms of these parameters. This study aims to compare physical activity levels, balance levels and muscular endurance values of PRD students according to grades and to determine whether they apply the knowledge they have learned to their own lives in proportion to the time spent as a student in this department. Our study is valuable because it will fill this gap in the literature.

In this context, our study hypothesises that the physical activity levels, balance levels and muscular endurance values of the PRD students are different from each other according to their grades.

Material and Methods

This article was produced from the first author's undergraduate thesis. This research was presented as an oral-abstract presentation (in Turkish) at the 2nd International Eurasian Health Sciences Congress on 15-16 June 2023.

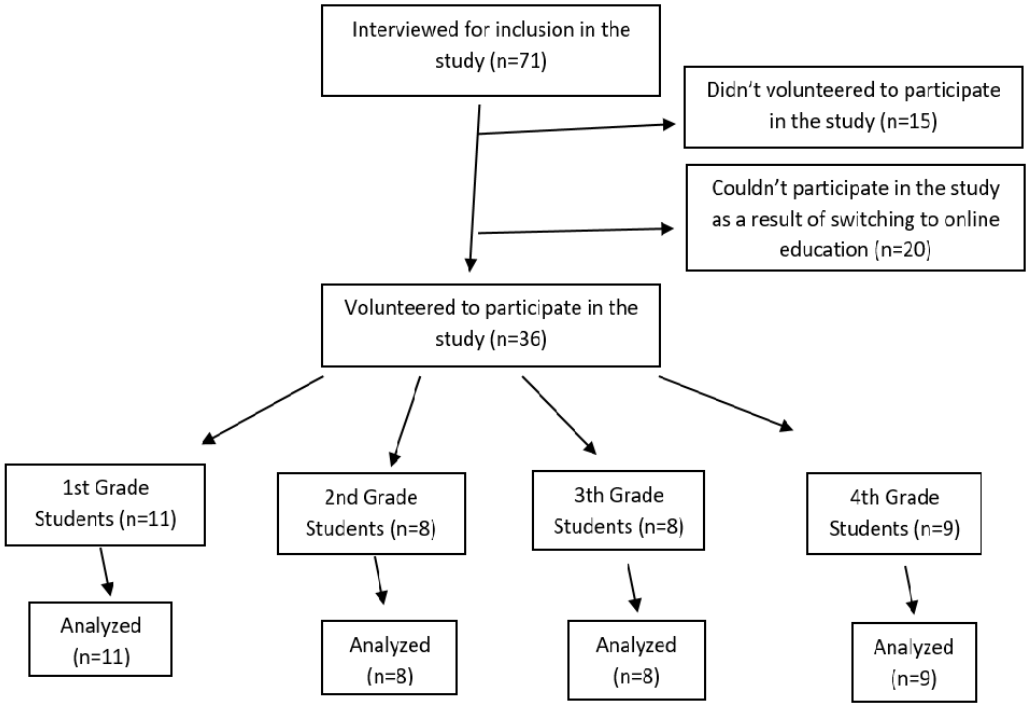
Ethics committee approval of our study was obtained from Istanbul Gelişim University Ethics Committee (dated 18.01.2023 and numbered 2023-02). This study was planned as parallel, cross-

sectional, descriptive and randomized controlled. The study was carried out in accordance with the Declaration of Helsinki in Istanbul Gelisim University Physical Therapy and Rehabilitation Laboratory between January and May 2023. In this study, in which the snowball randomization method was used, the data were obtained by face-to-face meeting method. The purpose and content of the study were explained to all participants, both orally and in writing, and written consent was obtained from those who volunteered to participate in the study.

Participants

Universe of the research consisted of all students studying in the PRD of the Faculty of Health Sciences of Istanbul Gelişim University. The sample size was determined as 14 students from each group and 56 students in total as a result of the data obtained from the pilot study and the G*Power analysis. Students who volunteered to participate in the study were included, while students who did not volunteer and those who had an injury that could affect balance were excluded from the study. While the data collection process was continuing, as a result of the earthquakes in Kahramanmaraş on February 6, 2023, higher education throughout Turkey was moved to online platforms and it was decided to end the spring semester online[15]. Our data collection process therefore stopped and the study was completed with 36 participants (Figure 1).

Figure 1. Flow Diagram



Evaluation Tools

In this study whose the primary output was the physical activity levels of the students, and the secondary outputs were balance and muscular endurance values, the demographic characteristics of the participants were recorded in the form prepared by the researchers.

Student's physical activity levels were examined with the International Physical Activity Questionnaire (IPAQ), which has Turkish validity and reliability[12-14]. In the last 7 days with the questionnaire, the duration (min.) of vigorous physical activity, the duration (min.) of moderate physical activity, duration of (min.) walking and sitting for one day were questioned. The results obtained were calculated by the original calculation method described by Craig et al. According to the total physical activity score, the physical activity levels of the participants were categorized as low (below 600 METs), medium (between 600-3000 METs) and high (above 3000 METs)[16-18].

Static balance was evaluated with the Flamingo Balance Test (FBT), which is a valid and reliable test. Students were asked to step barefoot on a 50 cm long, 5 cm high and 3 cm wide wooden material. Students flexed their untested extremity from the knee joint to 90°. They fixed their hands on their waist at the level of the crista iliaca. While the students were in balance in this way, the time was started and the student was asked to stand on the apparatus with one foot for one minute. The time was stopped when the students lost their balance (dropping their feet, falling off the platform or holding on to something else). After they regained their balance and got back on the mechanism, the time was continued from where she/he left off. Each attempt by the students to maintain their balance was counted as one point. The test was applied three times and the arithmetic average was taken and recorded. Both the dominant and non-dominant extremities of the students were evaluated[19-21].

Dynamic balance assessment was performed with the Y Balance Test (YBT), which is a valid and reliable test. Three measuring tapes were fixed on the laboratory floor with a distance of 135° between anterior and posteromedial directions, 135° between anterior and posterolateral directions, and 90° between posteromedial and posterolateral directions. The students were asked to position themselves in the center with their bare feet, to touch the extreme point they could touch 3 times in each direction with their fingers, and to put their hands on their waists at the level of the crista iliaca. The test was repeated in cases where the students lost their balance, put their lying foot somewhere other than the tape measure, the heel was cut off from the ground on their fixed foot and their hands were removed from the waist. The arithmetic mean of 3 successful measurements was recorded[22-24].

Muscular endurance was evaluated with the McGill Endurance Tests (MGET), which is a valid and reliable test group[25].

Trunk Flexion Endurance Test: Students were fixed on the bed by the physiotherapist in the supine position with their hips and knees flexed. While the trunk was 60° flexed, the arms were

positioned on the trunk by crossing them touching the shoulders. The test was terminated when distortion was detected in the trunk positions. If the individual continued the test without changing his position, the test was stopped after 180 seconds. The value measured with the stopwatch was recorded in seconds[25-27].

Trunk Extension Endurance Test: Students were positioned prone so that the pelvis, hips, and knees remained on the bed, with the spine hanging from the anterior superior level of the iliac spine. The students were asked to cross their arms by bringing them to the opposite shoulders and to stand in a position parallel to the ground and to maintain this position. Meanwhile, the lower extremities were fixed by the physiotherapist. When it was determined that this horizontal position was disturbed, the test was terminated and the time was recorded in seconds[25-27].

Trunk Lateral Endurance Test: The students were positioned in side-lying position with the arm perpendicular to the floor, elbow 90˚ flexed and forearm on the bed, the other arm crossed over the chest, the lower extremities extended and the upper foot in front of the lower foot. The test was started when the students lifted their hips on the ground and straightened their torso. The test was performed on the right and left sides. The students were asked to stop for the maximum amount of time they could without disturbing the position, and the time obtained was recorded in seconds[25].

Statistical Analysis

The data collected from this study were analyzed using version 24.0 of the IBM SPSS package program, which is a statistical analysis program. The suitability of the data to the normal distribution was evaluated with the Kolmogorov – Smirnov test. Descriptive features were given with mean and standard deviation. Kruskall Wallis test, Chi-Square test and ANOVA test were used in the analysis of the data. Statistical significance was evaluated at the $p<0.05$ level.

Results

36 students (15 male, 21 female) participated in our study. Demographic characteristics of the students were similar except for height (Table 1).

Table 1. Students' demographic characteristics

	Grades	n	Mean (SD)	p
Age	1st Grade	11	21.6	0.495
	2nd Grade	8	20.9	
	3rd Grade	8	21.8	
	4th Grade	9	24.1	
Height	1st Grade	11	173.5	

	2nd Grade	8	168.4	**0.007**
	3rd Grade	8	173.9	
	4th Grade	9	170.4	
Weight	1st Grade	11	74.7	0.865
	2nd Grade	8	62.9	
	3rd Grade	8	67.0	
	4th Grade	9	65.8	
BMI	1st Grade	11	24.6	0.946
	2nd Grade	8	22.1	
	3rd Grade	8	22.0	
	4th Grade	9	22.5	

BMI: Body Mass Index, SD: Standart Deviation, p= Kruskal Wallis test

No statistically significant difference was observed among the physical activity levels determined by the IPAQ of the students participating in the study (p>0.05) (Table 2).

Table 2. Students' physical activity levels

	Inactive	**Minimally Active**	**High Active**	**p**
1st Grade (n=11)	0 (%0)	8 (%72.7)	3 (%27.3)	0.214
2nd Grade (n=8)	2 (%25)	3 (%37.5)	3 (%37.5)	
3rd Grade (n=8)	1 (%12.5)	4 (%50)	3 (%37.5)	
4th Grade (n=9)	0 (%0)	3 (%33.3)	6 (%66.7)	

p= Chi-Square test

No statistically significant difference was observed among the static balance levels determined by the FBT of the students participating in the study (p>0.05). Results of the four groups were found to be similar (Table 3).

Table 3. Students' static balance levels

	Grades	**n**	**Mean (SD)**	**p[1]**
Dominant	1st Grade	11	16.5 (8.28)	0.627
	2nd Grade	8	17.3 (13.29)	
	3rd Grade	8	11.8 (6.55)	
	4th Grade	9	13.8 (9.35)	

	Grades	n	Median (IQR)	p²
Non - Dominant	1st Grade	11	16.33 (11.33)	0.550
	2nd Grade	8	9.00 (9.50)	
	3rd Grade	8	9.83 (25.63)	
	4th Grade	9	11.33 (10.00)	

SD: Standart Deviation, IQR: Interquartile Range, p¹: ANOVA test, p²: Kruskall Wallis test

No statistically significant difference was observed between the dynamic balance levels determined by the YBT of the students participating in the study (p>0.05). Results of the four groups were found to be similar (Table 4).

Table 4. Students' dynamic balance levels

	Grades	n	Mean (SD)	p
Anterior Direction	1st Grade	11	68.9 (10.01)	0.823
	2nd Grade	8	69.8 (3.73)	
	3rd Grade	8	72.5 (8.89)	
	4th Grade	9	71.1 (9.19)	
Posteromedial Direction	1st Grade	11	85.6 (11.88)	0.426
	2nd Grade	8	91.6 (14.84)	
	3rd Grade	8	96.5 (14.83)	
	4th Grade	9	93.4 (17.34)	
Posterolateral Direction	1st Grade	11	77.6 (16.29)	0.681
	2nd Grade	8	82.9 (15.04)	
	3rd Grade	8	83.9 (16.68)	
	4th Grade	9	86.2 (16.66)	

SD: Standart Deviation, p: ANOVA test

No statistically significant difference was observed among the muscular endurance values determined by the MGET of the students participating in the study (p>0.05). Medians of the four groups were found to be similar (Table 5).

Table 5. Students' muscular endurance values

	Grades	n	Median (IQR)	p
Left Side	1st Grade	11	28.0 (25.00)	0.543
	2nd Grade	8	25.0 (29.50)	
	3rd Grade	8	29.0 (17.50)	
	4th Grade	9	42.0 (16.00)	
Right Side	1st Grade	11	29.0 (21.00)	0.073
	2nd Grade	8	41.0 (21.25)	
	3rd Grade	8	37.5 (19.50)	
	4th Grade	9	47.0 (34.00)	
Extension	1st Grade	11	30.0 (20.00)	0.641
	2nd Grade	8	30.5 (43.50)	
	3rd Grade	8	104.5 (86.75)	
	4th Grade	9	55.0 (37.00)	
Flexion	1st Grade	11	52.0 (24.00)	0.495
	2nd Grade	8	45.5 (44.00)	
	3rd Grade	8	75.0 (75.00)	
	4th Grade	9	52.0 (85.00)	

IQR: Interquartile Range, p: Kruskall Wallis test

Discussion

In this study to compare the physical activity levels, static-dynamic balance levels and muscular endurance values of PRD students according to grades, no difference was observed between grades in any parameter. Researchers think that this result is due to the fact that higher education in Turkey has switched to online education as a result of the earthquakes in Kahramanmaraş as of 06.02.2023, and a total of 56 students, obtained from the sample size calculation, were not included in the study. Since this article was produced from the undergraduate thesis of the first author (AK), the study had to be completed with the collected data. For this reason, the study was completed with a total of 36 participants: 6 females and 5 males from 1st grade, 5 females and 3 males from 2nd grade, 4 females and 4 males from 3rd grade, and 6 females and 3 males from 4th grades. However, it will be done again in the 2023-2024 education period and the sample size in the G*Power analysis will be reached.

According to the physical activity level results of our study, 8.33% of the students were found to be inactive, 50% minimally active, and 41.67% very active. In a study conducted by Arslan and Arslan[28] to examine the physical activity habits of PRD 4th grade students during and before the COVID-19 pandemic, IPAQ was applied to 35 students. As a result, it was observed that the physical activity level of the students in the pre-pandemic period was much higher than in the pandemic period. While the number of inactive students was 4 (11.4%) before the pandemic, it increased to 11 (31.4%) during the pandemic period. While the number of very active students was 18 (51.4%) before the pandemic, it decreased to 14 (40.0%) during the pandemic period[28]. In the study of Zhai et al., in which they investigated the relationship among age, nationality, tobacco-alcohol use, physical activity level and sleep quality in university students and completed with 6793 participants, the average IPAQ score of all participants was found to be 2891.3 ± 1849.6 METs. This shows that most of the students are in the minimally active and very active groups[29]. Bednarek et al. 50 Turkish and 50 Polish students between the ages of 18-21 were included in their study to compare the physical activity levels of Polish and Turkish university students. While 78% of Polish students were found to be very active, 20% minimally active, and 2% inactive, 26% of Turkish students were found to be very active, 54% minimally active, and 20% inactive[30]. The results of our study are similar to the results of Zhai's study, the results of Bednarek's study, and the pre-pandemic results of Arslan's study. The situation that causes this is interpreted as the end of COVID-19 and the return to normal social life.

According to the results of this study, the static balance score average of the students measured with the FBT was found to be 14.95 on the dominant side and 10.47 on the non-dominant side. The mean dynamic balance score measured with the YBT was found to be 70.45 in the anterior direction, 91.30 in the posteromedial direction, and 82.32 in the posterolateral direction. Gökdemir et al. used the FBT to measure static balance and the Star Excursion Balance Test (SEBT) to measure dynamic balance in their study comparing the dynamic and static balance levels of university student football, volleyball and basketball players and sedentary university students. The average FBT score was 13.6 on the dominant side, 13.4 on the non-dominant side of the sedentary students; 5.3 on the dominant side, 5.5 on the non-dominant side of the football player students; 8.2 on the dominant side, 8.7 on the non-dominant side of the basketball player students; 5.2 on the dominant side, 5.3 on the non-dominant side of volleyball player students[20]. The results of this study show parallelism with the results of the sedentary student group of this study. In another study, Engquist et al. included 270 students (167 athletic students, 103 general students) to compare the YBT scores of athlete students and general university students. When the YBT scores are examined, the average of the athlete students in the anterior direction is 74.7, the average of the general students is 71.7; the average of the athlete students in the posteromedial direction is 116.4, the average of the general students is 110.7; the average of the athlete students in the posterolateral direction is 114.2, the average of the general students the mean was found to

be 108.6[31]. The results of both the sports students and the general students in this study are higher than the results of the students in this study.

In this study, the trunk muscular endurance medians of the students evaluated with the MGET were found to be 52 in the flexor direction, 30 in the extensor direction, 29 in the right lateral direction and 28 in the left lateral direction for the 1st grade students. 45.5 in flexor direction, 30.5 in extensor direction, 41 in the right lateral direction, 25 in the left lateral direction for 2nd grade students; 75 in flexor direction, 104.5 in extensor direction, 37.5 in right lateral direction, 29 in the left lateral direction for 3rd grade students; 52 in the flexor direction, 55 in the extensor direction, 47 in the right lateral direction, and 42 in the left lateral direction for 4th grade students. As a result, those with the highest muscular endurance are 3rd grade students, then 4th grade students, then 2nd grade students, and the lowest ones are 1st grade students. In the emergence of this result, we attribute the knowledge that students have learned over time to the fact that they have increased their application in their own lives. McGill et al. published normative data for university students in 2010. Accordingly, the flexor direction average is 123, the extensor direction average is 149, the right lateral direction average is 81, and the left lateral direction average is 80[32]. All the data we have obtained is noticeably lower than the normative data. Özkal also found the mean trunk flexor muscular endurance as 64.78, extensor muscular endurance average as 74.76, right lateral muscular endurance average as 36.27 in his study with Turkish students like us[33]. These results are more similar to studies results. Based on this, we think that the normative data published by McGill et al. may vary according to nationalities.

We had to reject all of our hypotheses as a result of this study, which was planned considering that there will be differences in physical activity levels, balance levels and muscular endurance among grades, as PRD students will apply the knowledge they have learned in their own lives over time. We think that the fact that higher education in Turkey turned to online education as of 06.02.2023 and that we could not reach the total number of participants we planned played a major role in the development of this situation.

As a limitation of this study, we can say that the number of participants is small. Another limitation of this study is that the gender distribution of the participants was not equal. In future studies, we recommend that multicenter studies be carried out by increasing the number of participants and normative data studies on muscular endurance according to nationalities.

Conclusion

All of our hypotheses were rejected in this study to compare the physical activity levels, balance levels and muscular endurance values of the PRD students among grades and to determine to what extent the students applied the knowledge they learned in the course to their own lives. There is no difference in physical activity levels, balance levels and muscular endurance values among the students of PRD. When physical activity results were examined, it was seen that there

were very few students in the inactive group. Based on this, we can say that PRD students are successful in applying the knowledge they learned in lectures in their own lives.

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