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Research Article

Resistive Exercises as a Healthy Life Style Behaviour on University Students' Lifespan

Hayriye Kul Karaali,[1] Duygu Ilgin,[1] Ozlem Ozcan,[1] Seyhun Kursat[2]

[1]Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, Manisa Celal Bayar University, Manisa, Turkey
[2]Department of Internal Medicine, Department of Nephrology, Manisa Celal Bayar University Faculty of Medicine, Manisa, Turkey

Abstract

Objectives: The purpose of this study was to evaluate the effect of resistive exercise training in university students on parameters of sleep, fatigue, academic achievement, anxiety, depression and quality of life.

Methods: A total of 40 volunteer students were included in the exercise (n=20) and control (n=20) groups. Both groups were evaluated at the beginning of the study and at the end of 8 weeks with data recording form, Pittsburgh Sleep Quality Scale, Piper Fatigue Scale, end-of-term grade point average, Beck Anxiety Scale, Beck Depression Scale, and Short Form-36 questionnaire.

Results: After the 8-week exercise program, it was determined that the sleep quality of the students in the exercise group increased (p=0.020), and the level of perceived fatigue (p=0.020) and physical role limitation (p=0.039) decreased.

Conclusion: As a conclusion, due to the positive effects on sleep quality, fatigue and quality of life, it was thought that resistance exercises could be recommended for the university students in order to protect and improve the health of young individuals.

Keywords: Behaviour, health, resistive exercises, university students

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University life is an important transition period in which young people try to adapt to the changes that take place in many areas of their lives, such as physical, psychological, academic and social environment. It is emphasized that the attainment of healthy lifestyle behaviours to students during this period of life as an intersection point is an important necessity for these behaviours to be transferred to adult life.[1] Students' low physical habits in this process are often associated with low quality of life,[2, 3] sleep quality,[4] and academic achievement,[5] and high levels of fatigue,[6] anxiety and depression.[7, 8] It is proposed by the World Health Organization to participate in aerobic and resistive type physical activities in order to protect and improve the health of young individuals.[9] Regular participation in the aerobic type of physical activity, which has been proposed in most of the previous studies, has emphasized positive effects on the above-mentioned parameters in university students.[5, 10–14] However, when the strengthening exercises are compared with the aerobic exercises, the number of studies examining the effects of resistive exercise training on the above mentioned parameters in university students is limited.[1, 15–19] For this reason, our study

Address for correspondence: Ozlem Ozcan, PhD. Manisa Celal Bayar Universitesi Tip Fakultesi, Fizyoterapi ve Rehabilitasyon Anabilim Dali, Uncubozkoy Saglik Kampusu, 5226 sokak. No: 8/4, 45030, Yunusemre, Manisa, Turkey
Phone: +90 505 706 36 73 **E-mail:** ozlem.ozcan@cbu.edu.tr

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was conducted to evaluate the effect of resistive exercise training in university students on the parameters related to sleep, fatigue, academic achievement, anxiety, depression and quality of life.

Methods

Subjects

This cross-sectional study included 40 students aged 18-25 years, out of 209 physiotherapy and rehabilitation students followed by Ethics Committee approval (27.08.2014, 20478486-291). The students were invited to the exercise program first by giving information about the study. Informed consent form was signed by the volunteer students. They were examined by the physician to determine if there were any obstacles to do the exercises involved in the research. The first 20 students who volunteered to participate in the evaluation and exercise practices to be performed in the study were included in the exercise group, and the first 20 students who only volunteered to participate in the evaluation program were included in the control group. The exercise group was included in the exercise program described below. No exercise program was administered to the control group. Exercise and control groups were re-evaluated after the program. All evaluations and exercises were carried out under supervision in the exercise room created within the scope of the study. Should students have complaints of progressive pain and the like for any reason during the 8-week exercise program were among the criteria of exclusion from the study. However, such a situation was not encountered during the program.

Assessment

The data obtained within the scope of the evaluation was recorded by face to face interview technique with the data recording form prepared by the researchers. The first part included open-ended questions about the age, height, body weight, body mass index, medical history, smoking and regular physical activity participation habits. The levels of sleep, fatigue, academic achievement, anxiety, depression and quality of life of the students were recorded using the questionnaires given below, in which Turkish reliability and validity studies were conducted. In addition, the heart rate, blood pressure, respiratory frequency and peripheral oxygen saturation values of the students in the exercise group were recorded before and after the program.

Surveys Used in the Research

Sleep Quality: The Pittsburgh Sleep Quality Scale has seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep activity, sleep disturbances, use of sleep medication, and daytime dysfunction. The total score has a value between 0-21. Those with a total score of 5 or less are considered "good" for sleep quality. A high total score indicates poor sleep quality.[20, 21]

Fatigue Level: The Piper Fatigue Scale includes behavioral/severity, affective meaning, sensory, and cognitive/mood sub-dimensions. The total score has a value between 0 and 5. The higher the total score, the higher the level of fatigue.[22, 23]

Academic Achievement: The end of term grade point average (GPA) score was recorded by examining the transcripts of the students according to the university's grading system.

Anxiety/Depression Levels: Beck Anxiety[24, 25] and Beck Depression[26, 27] surveys are scored between 0 and 63. High scores are interpreted as high anxiety and depression levels, and low scores as low anxiety level.

Quality of Life: Short Form 36 the quality of life questionnaire contains a total of 8 subcomponents; physical functioning, role limitations due to physical problems, bodily pain, general perception of health, vitality, social functioning, role limitations due to emotional problems, and general mental health. Scores range from 0 to 100. The high scores indicate that the level of quality of life is good, while the low scores indicate that the level of quality of life is bad.[28, 29]

Exercise Program

During the first week, students were informed about what exercises would be done, the mechanisms of action, possible positive effects of the program, points to watch out for, and the importance of participation in such programs. Exercises were performed under the supervision of a physiotherapist, 20-30 minutes a day, 3 days a week for a total of 8 weeks, 8-12 reps and 1-3 sets in the practice room at 18.3-20 degrees. Each session contained five minutes of warm-up and cooling periods. Resistive exercise program which covers large muscle groups of upper and lower extremity was performed using body weight, free weights (dumble and sandbag) and thera-band. The rest period between the sets was determined individually so as not to cause fatigue. The intensity of the exercises was gradually increased every week according to individual needs. The severity of the exercises was determined according to the level of individual development, starting from 60% of 1 maximal repetition to 85%, as recommended by the American College of Sports Medicine (ACSM).[30, 31]

Statistical Analysis

Statistical analysis of all data collected for data analysis and interpretation was done with SPSS version 21.0 program. Data were presented by calculating number, percent dis-

tributions and mean±standard deviation. Chi-square (X^2) analysis was used to compare groups in terms of gender, physical activity and smoking habits. For the non-parametric tests The Wilcoxon Signed-Rank test was used for the analysis of pre- and post-exercise values of dependent groups, while the Mann-Whitney U test was used to compare the differences between the final and initial assessment parameters between independent groups. A value of p≤0.05 was accepted as a statistical significance level.

Results

The main physical characteristics of the students in the exercise (n=20) and control (n=20) groups studied were as shown in Table 1 and there was no difference between the groups. Gender distribution was similar (80% female, p=1.000). Only 3 (15%) of the students in each group had regular physical activity habits. 3 (15%) of the students in the exercise group and 2 (10%) of the students in the control group were smoking. The smokers in the exercise group were smoking 3±0.80 packs a year, while the smokers in the control group were smoking 0.05±0.15 packs a year. Both groups were similar in terms of these two habits (p=1.000).

Table 1. Physical characteristics of the groups

	Exercise group	Control group	p
Age (years)	19.75±1.02	20.25±1.12	0.195
Height (m)	1.68±0.08	1.66±0.07	0.655
Weight (kg)	61.29±11.48	60.85±9.22	0.797
Body mass index (kg/m^2)	21.64±2.57	21.92±2.36	0.646

Data are presented as mean±standard deviation (X±SD).

When the pre-exercise values of the students in the exercise and control groups were compared with each other, the groups were similar in terms of all other parameters except that the anxiety score was higher in the control group than in the exercise group (p=0.047). No difference was found in the control group when the values obtained before the exercise program were compared with the values obtained after the exercise. In the exercise group, subjective sleep quality (p=0.020), sleep latency (p=0.017), sleep disturbance (p=0.035), daytime dysfunction (p=0.004) and total (p=0.001) scores which were measured by the Pittsburgh Sleep Quality Scale were decreased.

Behavioral (p=0.046), affective (p=0.003), sensory (p=0.002), cognitive (p=0.001) and total (p=0.001) scores which were determined by the Piper Fatigue Scale, were decreased. Depression score (p=0.001) which was evaluated using Beck Depression Scale was determined to be decreased, while on the other hand, it was determined that scores of vitality (p=0.006), social function (p=0.008) and emotional role restriction (p=0.051) which were evaluated using Short Form-36, were observed to be increased (Table 2, 3).

When the differences between the scores of the last and first evaluation of both groups were compared, Pittsburgh

Table 2. The comparison of the main outcomes (Sleep Quality, Fatigue Level) of the groups

	Exercise group			Control group		
	1st assessment	2nd assessment	p	1st assessment	2nd assessment	p
Sleep quality (Pittsburgh Sleep Quality Index= PSQI)						
Subjective sleep quality	1.25±0.64	0.75±0.64	0.020*	1.10±0.55	1.05±0.51	0.739
Sleep latency	1.45±1.00	0.85±0.88	0.017*	1.30±1.03	1.10±0.72	0.285
Sleep duration	0.05±0.22	0.05±0.22	1.000	0.25±0.55	0.55±1.00	0.084
Habitual sleep efficiency	0.20±0.41	0.15±0.37	0.655	0.15±0.67	0.35±0.81	0.414
Sleep disturbances	1.15±0.49	0.80±0.52	0.035*	1.40±0.50	1.20±0.52	0.102
Use of sleep medication	0.00±0.00	0.00±0.00	1.000	0.15±0.67	0.00±0.00	0.317
Daytime dysfunction	1.05±0.61	0.55±0.61	0.004*	1.05±1.05	0.90±0.64	0.490
PSQI global score	5.15±2.18	3.15±2.06	0.001*	5.40±3.17	5.15±2.21	0.775
Fatigue level (Piper Fatigue Scale)						
Behavioral/ Severity	2.25±2.13	1.69±1.74	0.046*	2.30±1.45	3.12±1.91	0.167
Affective meaning	3.52±1.52	2.31±1.66	0.003*	3.20±1.80	3.14±2.09	0.513
Sensory	4.17±1.29	2.71±1.71	0.002*	3.27±2.18	2.87±2.17	0.364
Cognitive/Mood	3.08±1.05	1.84±1.20	0.001*	2.92±2.02	2.35±1.95	0.246
Total fatigue score	3.20±1.07	2.11±1.33	0.001*	2.90±1.61	2.86±1.81	0.520

Data are presented as mean ± standard deviation (X±SD); *p≤0.05 has been accepted as statistical significance level.

Table 3. The comparison of the main outcomes (Academic Achievement, Depression-Anxiety Levels, Quality of Life) of the groups

	Exercise group			Control group		
	1st assessment	2nd assessment	p	1st assessment	2nd assessment	p
Academic achievement (The-end-of-term grade point average/GPA)						
GPA	2.94±0.58	3.02±0.67	0.533	3.04±0.61	2.98±0.78	0.467
Anxiety level (Beck Anxiety Inventory)						
Total score	7.00±4.21	6.25±5.32	0.554	12.40±9.40	13.45±7.21	0.740
Depression level (Beck Depression Inventory)						
Total Score	9.95±5.47	5.55±5.40	0.001*	10.45±5.78	8.60±5.92	0.058
Quality of life (Short Form 36 Health Survey)						
Physical functioning	91.50±12.37	93.50±10.77	0.400	89.50±10.75	90.50±10.63	0.574
Role limitations (physical problems)	78.75±38.28	88.75±18.98	0.121	72.50±39.65	56.25±40.45	0.087
Bodily pain	72.55±20.21	76.35±14.69	0.285	69.90±19.49	69.70±19.69	0.844
General health perceptions	71.50±15.31	77.00±10.08	0.197	66.70±17.95	66.80±17.65	0.735
Vitality	59.75±15.77	69.25±16.65	0.006*	62.00±16.42	63.00±18.67	0.830
Social functioning	78.75±19.07	88.75±15.12	0.008*	73.13±14.21	76.25±19.41	0.319
Role limitations (emotional problems)	58.33±41.71	78.33±34.67	0.051*	61.67±40.86	53.33±41.04	0.426
General mental health	65.80±13.07	70.60±13.63	0.261	67.60±12.97	66.00±17.04	0.691

Data are presented as mean±standard deviation (X±SD); *p≤0.05 has been accepted as statistical significance level.

Sleep Quality Scale total (p=0.020) and Piper Fatigue Scale behavioral (p=0.020) scores were observed to be dropped significantly more in the exercise group. The increase in physical role limitation score assessed by short-form 36 was greater in the exercise group (p=0.039) (Table 4, 5).

Discussion

To our knowledge, this study is the first in investigating whether the resistive exercise training for university students has effects on sleep quality, quality of life, academic achievement, anxiety, depression and fatigue levels whose

Table 4. The comparison of the delta of the main outcome parameters (Sleep Quality, Fatigue Level) of the groups

	Exercise group	Control group	p
	Delta= 2nd assessment – 1st assessment		
Sleep quality (Pittsburgh Sleep Quality Index= PSQI)			
Subjective sleep quality	-0.50±0.83	-0.05±0.69	0.061
Sleep latency	-0.60±1.00	-0.20±0.83	0.216
Sleep duration	0.00±0.32	0.30±0.73	0.131
Habitual sleep efficiency	-0.05±0.51	0.20±1.11	0.206
Sleep disturbances	-0.35±0.67	-0.20±0.52	0.488
Use of sleep medication	0.00±0.00	-0.15±0.67	0.317
Daytime dysfunction	-0.50±0.61	-0.15±1.09	0.153
PSQI global score	-2.00±2.43	-0.25±2.59	0.020*
Fatigue level (Piper Fatigue Scale)			
Behavioral/Severity	-0.56±1.25	0.82±2.12	0.020*
Affective meaning	-1.21±1.46	-0.06±2.22	0.085
Sensory	-1.46±1.74	-0.40±2.97	0.083
Cognitive/Mood	-1.24±1.27	-0.58±2.58	0.163
Total fatigue score	-1.10±0.99	-0.04±2.00	0.053

Data are presented as mean±standard deviation (X±SD); * p≤0.05 has been accepted as statistical significance level.

Table 5. The comparison of the delta of the main outcome parameters (Academic Achievement, Depression-Anxiety Levels, Quality of Life) of the groups

	Exercise group	Control group	p
	Delta= 2nd assessment – 1st assessment		
Academic achievement (The-end-of-term grade point average/GPA)			
GPA	0.07±0.47	-0.06±0.42	0.304
Anxiety level (Beck Anxiety Inventory)			
Total score	-0.75±4.48	1.05±7.45	0.597
Depression level (Beck Depression Inventory)			
Total score	-4.40±4.71	-1.85±4.04	0.128
Quality of life (Short Form 36 Health Survey)			
Physical functioning	2.00±10.93	1.00±8.37	0.757
Role limitations (physical problems)	10.00±27.39	-16.25±39.13	0.039*
Bodily pain	3.80±17.70	-0.20±15.41	0.407
General health perceptions	5.50±16.62	0.10±12.81	0.446
Vitality	9.50±12.13	1.00±17.14	0.239
Social functioning	10.00±14.96	3.12±16.16	0.383
Role limitations (emotional problems)	20.00±42.44	-8.33±45.72	0.064
General mental health	4.80±14.43	-1.60±12.87	0.318

Data are presented as mean±standard deviation (X±SD); *p≤0.05 has been accepted as statistical significance level.

negative relationships with physical inactivity have been demonstrated in many studies. And our study results show that in university students, the progressive-resistance exercise program implemented as 3 days a week for a period of 8 weeks reduced the perceived fatigue level and increased the sleep quality and quality of life. On the other hand, there was no change in the academic achievement, anxiety and depression levels of the students.

In the previous studies, participation in activities involving regular aerobic and/or strengthening exercises in university students has been shown to have a positive effect on quality of life.[2, 3] Moreover, exercise frequency[32] and intensity characteristics[32, 33] are reported to be determinants of quality of life. Additionally, in support of the survey data mentioned above, it has been shown that exercise programs, in one study consisting of an 8-week aerobic[10] and in another study consisting of a combination of 12-week aerobic and resistance[17] exercises, had positive affects on students' quality of life scores. In our study, only an exercise program consisting of progressive-resistive exercises was administered 3 days a week for 8 weeks, and it resulted in a positive increase in the quality of life scores, in line with other research results.

It has been reported that aerobic[11] and acute-resistive[18] exercise programs affect sleep quality positively in university students. It is also argued that the intensity of regular physical activity is also determinative in terms of sleep quality.[4] On the other hand, the self perceived health and satisfaction with exercise participation levels are also reported as parameters affecting the students' sleep quality and quality of life positively.[32] In our study, in accordance with previous research data, it was determined that all students completed an 8-week program with progressive-resistive exercises and that sleep-related scores increased after the program.

Puetz 2006 et al.[6] emphasize that the effects of resistive exercises on fatigue are not very clear. It has been reported that aerobic exercises in young adults reduce perceived fatigue severity.[6, 11] It is also suggested that the severity of aerobic exercises is important in reducing the fatigue perception.[6] This study showed that individualized progressive resistive exercises caused a decrease in the fatigue perceptions of the students in the exercise group. When the difference between the first and last evaluations of the two groups is compared, it is seen that the behavioral fatigue subscore of the exercise group decreases in accordance with the literature and this value increases in the control group. This increase in the control group was thought to be related to the fact that the final assessment made at week eight coincided with the exam week.

Lee et al.[5] reported that academic achievement was influenced positively by aerobic physical activity participation. It is also suggested that regular aerobic activity participation is associated with a higher GPA than participation in weight lifting activities.[12] Keating et al.[1] suggest that participation frequency for resistive exercises is correlated with high GPAs of university students. On the other hand, previous studies have shown that cognitive performance,

which is closely related to academic achievement, is positively affected by resistive and aerobic exercises,[34] and is associated with severity[35, 36] and duration[37] of resistive exercises. Ansari et al.[38] suggest that there is no relationship between physical activity participation and the students' self-reported academic achievement. On the contrary, Ansari et al.[39] suggest that the frequency of physical activity participation affects students' self-reported academic achievements positively. In our study, it was also seen that the progressive-resistive exercise program, which was supervised and applied for 8 weeks, did not affect the the end-of-term GPA which evaluates the academic achievement. In interpreting our results, it should not be overlooked that this difference with the literature can be due to the fact that instead of using the students' cumulative GPA and 1-5 scaled self-reported academic achievement grading system which are indicated in other studies, we have taken into account only the end-of-term GPA grades of the relevant term.

Depression and anxiety symptoms of college students have been shown to be associated with inadequate physical activity habits.[7, 8] It has been reported that participation in aerobic-type regular physical activity and exercise programs in university students has an effect on both prevention and relieving symptoms of depression.[13] In addition, in many review studies, it was stated that the management of anxiety symptoms was frequently performed in different age and clinical groups, but the effects of strengthening exercises were examined less frequently.[14–16] When acute effects are examined, it is stated that exercise reduces the level of anxiety, even though a little bit, in adults.[40] It has been stated that the positive effects of resistive exercises that are applied with low-moderate intensity and as a single session are more pronounced on anxiety. It is reported that gender is also an important factor on the results of resistive exercise programs. Moreover, it has been emphasized that long-term resistive exercises and resistive exercise programs combined with aerobic exercises also have positive effects on reducing anxiety.[16] Unlike other studies, there was no statistically significant decrease in depression and anxiety scores in our study compared to the previous values in both groups after the exercise program. This may be related to the fact that the students' final assessments corresponded to the week before the final exam week, or that our study was conducted with the healthy university students, not with the individuals diagnosed with anxiety and/or depression.

The main limitation of our study was its cross-sectional design that does not allow definitive conclusions about causal relationships. Second limitation of our study was the limited number of our participants. This may limit the generalizability of the results. Other limitation of our study was that we did not investigate gender effects on the results. This points should be taken into account in future studies.

Conclusion

As a conclusion, our research results have shown that 8 weeks of supervised progressive-resistive exercise training had positive effects on perceived fatigue, sleep and quality of life of the university students. Our results will contribute to the evidence-based literature in terms of planning standardized exercise programs aimed at gaining and maintaining healthy lifestyle behaviours for younger college students.

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Disclosures

Ethics Committee Approval: Our study was approved by the Institutional Ethics Review Board of Celal Bayar University Medical Faculty of Medicine, Local Ethics Committee (Date 27.08.2014, Number: 20478486-291).

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