Video-Based Physical Exercise Effects on Young Adults in Social Isolation During the Coronavirus Pandemic

Yasemin BURAN ÇIRAK*, Burcu IŞIKCI**, Kübra KARDEŞ***, Yunus Emre TÜTÜNEKEN****, Gül Deniz YILMAZ YELVAR*****, Habibe Serap İNAL******

Abstract

Aim: The aim of this study is to evaluate the effectiveness of video-based exercises on the physical activity levels of individuals between the ages of 18-40 in social isolation to prevent the spread of the COVID-19 pandemic.

Method: 64 volunteers participated as the control and 64 study groups were divided randomly and equally into two groups, the video-based exercise group (VEG) and the control group (CG). The video-based exercise group was included in an exercise program for 20 minutes, 7 days a week for 6 weeks. The primary outcome measure was the International Physical Activity Questionnaire (Short Form) (IPAQ-SF). Secondary outcome measures were the Nottingham Health Profile (NHP), Pittsburgh Sleep Quality Index (PSQI), Beck Anxiety Inventory (BAI), Distress Tolerance Scale (DTS), sit and reach test, shoulder flexibility test, squat test, plank test, lateral bridge test (LBT), crunch test and single leg stance test (SLST). Tests were applied to the groups at the beginning and the end of the study.

Results: There was a statistically significant difference in all parameters in the study group before and after the application (p<0.05). According to the intergroup comparisons, there was a statistically significant increase between the groups in IPAQ-SF, Sit and Reach Test, Push Up Test, Plank Test, LBT, and SLST Tests; there was a statistically significant decrease between the groups in DTS, BAI, PSQI, and NHP scores (except for pain and social isolation scores) (p<0.05).

Conclusion: Our findings will shed light on the management of the physiotherapy and rehabilitation process by contributing to the increasing evidence in the literature on the effectiveness of video-based

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* Prof. Dr., Istinye University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Türkiye. E-mail: ycirak@istinye.edu.tr ORCID https://orcid.org/0000-0002-8044-8539
** Res. Assist., Istinye University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Türkiye. E-mail: burcu.pamukcu@istinye.edu.tr ORCID https://orcid.org/0000-0002-4515-7656
*** Lecturer, Istinye University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Türkiye. E-mail: kubra.koce@istinye.edu.tr ORCID https://orcid.org/0000-0003-4166-085X
**** Lecturer, Istinye University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Türkiye. E-mail: yunus.tutuneken@istinye.edu.tr ORCID https://orcid.org/0000-0003-4080-5105
***** Assoc. Prof. Dr., Istinye University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Türkiye. E-mail: gul.yelvar@istinye.edu.tr ORCID https://orcid.org/0000-0002-6960-5302
****** Prof. Dr., Istanbul Galata University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Istanbul, Türkiye. E-mail: srpI.oan@gmail.com ORCID https://orcid.org/0000-0003-1818-121X

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exercises and improving health-related multifaceted parameters in various post-pandemic situations where access to health services and preventive rehabilitation is restricted.

Keywords: Coronavirus, COVID, exercise, physical activity, video-based

Koronavirüs Nedeniyle Sosyal İzolasyon Sürecinde Genç Yetişkinlerde Video Tabanlı Egzersizlerin Etkililiği

Öz

Amaç: Bu çalışmanın amacı, COVID-19 pandemisinin yayılmasını önlemek için sosyal izolasyonda bulunan 18-40 yaş arasındaki bireylerin fiziksel aktivite düzeylerine yönelik video tabanlı egzersizlerin etkinliğini değerlendirmektir.

Yöntem: 64 gönüllü kontrol ve 64 çalışma grubu rastgele ve eşit olarak video tabanlı egzersiz grubu (VEG) ve kontrol grubu (CG) olmak üzere iki gruba ayrıldı. Video ağırlıklı egzersiz grubuna 6 hafta boyunca haftada 7 gün 20 dakikalık egzersiz programı uygulandı. Birincil sonuç ölçütü olarak Uluslararası Fiziksel Aktivite Anketi (Kısa Form) (IPAQ-SF) kullanıldı. İkincil sonuç ölçütleri Nottingham Sağlık Profili (NHP), Pittsburgh Uyku Kalitesi İndeksi (PSQI), Beck Anksiyete Envanteri (BAI), Sıkıntı Tolerans Ölçeği (DTS), otur ve uzan testi, omuz esnekliği testi, çömelme testi, plank testi, lateral köprü testi (LBT), crunch testi ve tek ayak üzerinde durma testi (SLST) olarak belirlenerek katılımcılar çalışmanın başında ve sonunda değerlendirildi.

Bulgular: Uygulama öncesi ve sonrası çalışma grubunda tüm parametrelerde istatistiksel olarak anlamlı fark vardı ($p<0,05$). Gruplar arası karşılaştırmalara göre IPAQ-SF, Sit and Reach Test, Push Up Test, Plank Test, LBT, SLST Tests sonuçlarında gruplar arasında çalışma grubu lehine istatistiksel olarak anlamlı artış, DTS, BAI, PSQI ve NHP puanlarında (ağrı ve sosyal izolasyon puanları hariç) çalışma grubu lehine istatistiksel olarak anlamlı azalma vardı. ($p<0,05$).

Sonuç: Bulgular, sağlık hizmetlerine erişimin kısıtlı olduğu ve önleyici rehabilitasyonun önemli olduğu çeşitli post-pandemi durumlarında video tabanlı egzersizlerin etkinliğine ve sağlıkla ilgili çok yönlü parametrelerin iyileştirilmesine ilişkin literatürde artan kanıtlara katkıda bulunarak fizyoterapi ve rehabilitasyon sürecinin yönetimine ışık tutacaktır.

Anahtar Sözcükler: Koronavirüs, COVİD, egzersiz, fiziksel aktivite, video temelli

Introduction

Although one of the most effective methods of protection from COVID-19 is to stay at home and ensure social isolation, constant confinement combined with restricted freedom, and a sedentary lifestyle with limited movement may cause diseases including muscle weakness, postural disorders, diabetes, obesity, and cardiovascular diseases[1,2]. In addition, limited sociability, decreased social contact with family or friends and decreased communication can lead to depression, anger, and anxiety[3]. Relief may come from exercising under the guidance of an instructor with the help of current and advanced technologies like the internet. To this end, platforms have emerged taking advantage of new technologies such as the Kinect threedimensional virtual sports platform[4], the development of web exercises for shoulder problems, telerehabilitation, and video exercise methods[5].

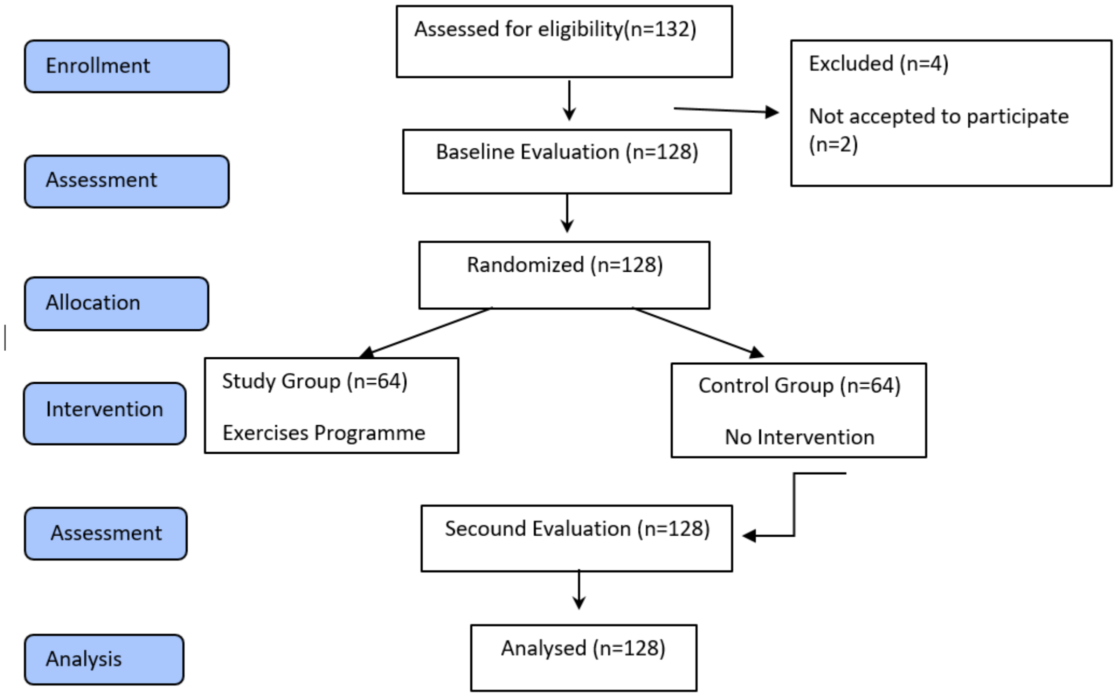
Studies have shown the efficacy of such methods. One study showed home exercise programs using videos and reminders on tablet computers to be useful[5]. Another study showed videoconferencing-based supervised resistance exercises to have positive effects on sarcopenia, lean soft tissue, lower extremity muscle mass, and chair-sit-and-reach scores in the elderly[6]. Systematic review and meta-analysis showed telerehabilitation to be effective in patients with cardiac disease demonstrating that this method provides benefits similar to cardiac rehabilitation without reported side effects[7]. Another study reported using a video program to be effective in increasing motivation and regular physical activity in patients with Type-2 Diabetes[8]. Considering all this, home exercise programs promoting increased physical activity delivered through technologies may be beneficial for preventing various health problems as we increasingly spend at home due to the COVID-19 pandemic. Studies main hypothesis is that video-based exercises applied to individuals in social isolation during the COVID-19 pandemic have a positive effect on physical activity level, quality of life, flexibility, endurance, and balance parameters. This study aims to evaluate the effectiveness of video-based exercises on the physical activity levels of individuals between the ages of 18-40 in social isolation to prevent the spread of the COVID-19 pandemic.

Material and Methods

Participants

128 volunteers aged between 18 and 40 were included in the study; 64 were in the study group and 64 were in the control group. A flow diagram of the study selection process is shown in Figure 1. The study required participants to be between the ages of 18-40, healthy, and completely homebound during the social isolation process. The study excluded candidates who had to take a break from sports due to injury; who had coronary risk factors or any chronic disease we could not treat; who were not cooperative; who had neurological problems or clinical presentations like thyrotoxicosis, kidney failure, and infections that might affect performance or be aggravated by exercise; and who had been doing exercise regularly in the last 6 weeks. Informed consent was obtained from all participants. Ethics committee approval of our study was received by the Istinye University Ethics Committee with the decision dated 23.07.2020 and file number 65. Approved all study methods before the study began.

Figure 1. Flow diagram of study



Procedure

A video-based exercise protocol was created for the study group and study participants were divided into two groups (study and control) by simple computer-assisted randomization. The subjects in the control group were not given any exercise tasks. After being evaluated, they were informed of the benefits of one session of exercise and introduced to the physical activities and the exercises in the training booklet. The same evaluator assessed participants before and after the 6-week period. Program follow-ups were made daily by phone calls. The therapist who followed the program was blind to the evaluations.

Participant socio-demographic information, lower and upper extremity strength, endurance, balance, sleep, and quality of life were evaluated before and after the program via a virtual network.

Socio-Demographic Information: Participants' age, gender, body weight and height, Body Mass Index (BMI), education level, habits (smoking, alcohol, exercise), and clinical data were collected, and web-based forms were used to evaluate this socio-demographic information.

Physical Activity Habits: International Physical Activity Questionnaire (Short Form) (IPAQ-SF) was used to determine the physical activity levels of the participants. The IPAQ-SF allows Metabolic Equivalent Threshold (MET) calculation by measuring frequency, duration, and physical activity intensity level over the previous seven days in all contexts, providing the amount of weekly physical activity. MET is calculated as weekly working hours (MET-hours / week). A value below 300 MET was determined to be level 1, between 300-600 MET as level 2, between 600-3000 MET as level 3, and above 3000 MET as level 4[9].

Quality of Life: The Nottingham Health Profile (NHP) was used to assess the participants' health-related quality of life[10]. NHP is a general quality of life questionnaire evaluating the level of health problems of individuals and how they affect activities of daily life[11]. Its rating is between 0 and 100. In the scale, low scores are interpreted as “being affected less by the disease”, and high scores are interpreted as “being affected more by the disease”.

Sleep Quality: The sleep quality of the participants was evaluated with the Pittsburgh Sleep Quality Index (PSQI). This scale provides a quantitative measure of sleep quality to define good and bad sleep[12]. It has 7 components and consists of 24 questions, 19 of which are answered by the individual and the remaining 5 by the spouse or a friend. Each question valued at between 0 and 3 points and the score is between 0-21. Questions answered by the individual are included in the scoring. A high total score indicates poor sleep quality.

Anxiety Status: Anxiety status of the cases was evaluated with Beck Anxiety Inventory (BAI)[13]. BAI consists of 21 questions and is scored on a scale of 0 (not at all) to 3 (serious). The more severe the anxiety symptoms produce higher BAI scores.

Depression Status: The depression symptoms of the cases were evaluated with the Beck Depression Inventory (BDI)[14], consisting of 21 questions. The questions are scored on a scale of 0 (not at all) to 3 (serious). More severe depression symptoms produce higher scores.

Flexibility: The sit-and-reach test was used to evaluate the flexibility of the back and leg muscles[15]. The participant sat on the floor with the soles of their feet against a box and their hips flexed to approximately 90° and reached forward as far as possible while maintaining this position. The distance reached was recorded in cm.

The shoulder flexibility test was used to assess the flexibility and mobility of the shoulder joint. The test measures how close the hands can be put together over the back and gives an idea of shoulder flexibility. The participant was asked to bring the fingertips together as close as possible, and the distance was measured. In cases where the middle fingers did not touch each other, the distance was recorded as (-) in cm; in cases where the middle fingers touched each other end-to-end, the value was (0); and in cases where one of the middle fingers crossed the other, the distance crossed by the middle finger was recorded as (+) in cm.

Muscle Strength and Endurance: The squat test was used to measure the strength of the knee extensors. After standing upright on a flat surface with the feet shoulder-width apart and the arms by the hips, the participant was asked to lower to a sitting position, then rise to an upright position. The participant was asked to do as many squats as possible without resting. The maximum number wasrecorded[16].

Plank tests were used to measure the endurance of the participants' back and core muscles[17]. The upper body was supported off the ground by the elbows and forearms, with the feet and legs straight and the weight taken up by the toes. The hips were lifted off the ground to form a straight line from head to toe and the test ended when the participant was unable to keep their back straight and had to lower their hips. Time was kept with a stopwatch and recorded. The side plank test was used to measure the endurance of the lateral abdominal and core muscles. In the side-lying position, the shoulder rested on the front elbow with the forearm supported in extended side-lying position, while the hip was lifted from the ground to form a straight line from head to toe. The test ended when the participant was unable to keep their back straight and lowered their hips. The time the person stayed in the elevated position was timed with a stopwatch and recorded.

The crunch test was used to measure abdominal muscle endurance[18]. While lying on the back with knees bent and the soles of the feet flat on the ground, the participant was asked to lift his torso and waist to the sitting position, without any support from his arms, keeping them aligned, then lowering himself to his/her original position. The maximum number of repetitions the participant completed in 1 minute was recorded.

Balance: The Single Leg Stance Test (SLST)was used to measure static balance[19]. In the test, the person was asked to stand on one leg for 60 seconds. Contact of the leg lifted with any surface was considered unsuccessful. The time the person remained in balance was recorded twice, once with the eyes open and once with the eyes closed.

Statistical Analysis

Sample size, 95% confidence interval, 5% margin of error and 95% power were calculated using “G*Power” and effect size (EB=2.96) for both groups. Though the study determined that 62 participants should be included in each group, it was decided that 64 volunteers should be included in each group due to the possibility that participants would leave the study. Thus, the study group totaled 128 participants. The Statistical Package for Social Sciences (SPSS) 20 program was used for statistical analysis of the data. The "Shapiro Shapiroest" was used to determine the normal distribution of the data. Parametric tests evaluated the data showing normal distribution according to the analyses; nonparametric tests evaluated data not showing a normal distribution. “Paired Sample t Test” or “Wilcoxon Signed Rank Test” made intra-group evaluations and “Independent Sample t Test” or “Mann Whitney U Test” made intergroup evaluations. The Statistical significance level was accepted as $p<0.05$. Δ designated the difference between pre- and post-exercise mean values (last measurement-first measurement). The mean (M) and standard deviation (SD) values of the data were calculated. The formula (Final Measurement-First Measurement) / First Measurement SD calculated the effect size (ES) of the within-group change before and after the program. An ES value between 0.2 and 0.5 was accepted as “small”, between 0.51 and 0.80 as “moderate”, and above 0.8 as “large”.

Exercise Program

By using the computer-assisted randomization method, the cases included in the study were divided into two groups by a researcher who was blinded from the post-assessment evaluation. A video-based exercise protocol was created for the study group as a combination of strengthening, aerobic exercises, posture, and High-intensity interval training (HIIT) exercises. Each exercise session was administered to participants for 20 minutes, 7 days a week for 6 weeks by researchers who were blinded to the evaluation. The protocol started with warm-up exercises and ended with cool-down exercises. Participants were classified in 4 levels according to their physical activity levels, and exercises were shared with them according to their physical activity level. The first level consists of low-intensity exercises, the 2nd and 3rd level moderate exercises consist of 4th level high-intensity exercises. Progress in the exercise program was made every 2 weeks as progress to the next level, with increases in duration and repetitions. (Table 1).

Table 1. Exercise program

1st Level	**2nd Level**	**3rd Level**	**4th Level**
Plank15 sec	Plank30 sec	Plank60 sec	Plank (Alternative Bilateral Hip Extension)90 sec
Knee Push Up 8x3	Regular Push Up10x3	Push Up (Knee Touch)10x3	Wide Push Up or Diamond Push Up12x3
Lunge8x3	Lunge (Body Rotation Added)10x3	Alternating Lunge (Forward And Backward) 10x3	Alternating Lunge Forward and Backward (Body Rotation Added) 12x3
Wall Squat8x3	Isometric Squat10x3	Bulgarian Squat10x3	Rebound Squat12x3
Crunch8x3	Cross Crunch10x3	Long Arm Cross Crunch 10x3	Bicycle Cross Crunch12x3
Standing Knee Raises 30 sec.x3	Knee Raises in Crawling Position 10x3	Fire Hydrant 10x3	Mountain Climbers 12x3
Bridge8x3	Bridge (With Alternating Arm Flexion) 10x3	Bridge (10 Sec. Stabilization on One-Leg Stance) 10x3	Bridge (One Leg + Leg Circle)12x3
Side Plank (On the knees) 15 sec.	Side Plank 30 sec.	Side Plank (+arm and leg elevation)60 sec.	Side Plank (+arm and leg elevation) 90 sec.
One-Leg Stance (On a flat floor with eyes open) 30 sec. x3	One-Leg Stance (On a flat floor with eyes closed)30 sec. x3	One-Leg Stance (On an unstable floor with eyes open and closed) 30 sec. x3	One-Leg Stance (Squat and throwing and catching a ball on an unstable floor) 30 sec. x3

Results

The study and control groups shared similar socio-demographic characteristics (p>0.05) (Table 2), (Table 3). There was a statistically significant difference in all parameters in the study group before and after the application (p<0.05).

Table 2. The Sociodemographic Features of the Participants

Variable		**Study Group (n=70)**	**Control Group (n=68)**	**p**
		X±SS	**X±SS**	
Age, (years)		25.08±4.98	26.79±5.86	0.097
BMI, (kg/m²)		23.31±3.29	24.44±4.64	0.276
		n (%)	**n (%)**	
Gender	*Female*	31 (44.3)	39 (57.4)	0.125
	Male	39 (55.7)	29 (42.6)	
Marital status	*Married*	13 (18.6)	22 (32.8)	0.056
	Single	57 (81.4)	45 (67.2)	
Smoking	*Yes*	26 (37.1)	21 (30.9)	0.438
	No	44 (62.9)	47 (69.1)	
Alcohol Use	*Yes*	14 (20)	14 (20.6)	0.932
	No	56 (80)	54 (79.4)	
Education status	*Primary/secondary school*	5 (7.1)	8 (11.8)	
	High school	14 (20)	12 (17.6)	0.635
	University/postgraduate	51 (72.9)	48 (70.6)	
Working Status	*Working*	31 (44.3)	31 (45.6)	0.878
	Not Working	39 (45.6)	37 (54.4)	

Chi-square test. Mann Whitney U test, BMI. Body Mass Index; *. p<0.05. Statistically significant values are given in bold.

There was no statistically significant difference in the comparison of all measurements taken before treatment in the study and control groups between the groups. (p>0.05) (Table 3).

Table 3. Comparison of all measurements taken before treatment between groups

Variable	Group	N	X±SD	p
Upper Limb Flexibility Test (cm)	Study	70	4.40±6.75	0.988
	Control	68	4.87±7.68	
Sit and Reach Test (cm)	Study	70	3.72±9.32	0.333
	Control	68	5.07±18.94	
Squat Test (number of repetitions)	Study	70	31.48±39.95	0.756
	Control	68	28.94±26.05	
Push Up Test (number of repetitions)	Study	70	22.58±21.59	0.254
	Control	68	23.61±14.19	
Plank Test (sec)	Study	70	65.80±70.38	0.475
	Control	68	54.14±53.70	
Lateral Bridge Test (sec)	Study	70	39.34±47.75	0.179
	Control	68	33.27±35.82	
Single Leg Stance Test (right side, sec)	Study	70	81.15±89.85	0.067
	Control	68	50.61±51.97	
Single Leg Stance Test (left side, sec)	Study	70	67.72±77.92	0.170
	Control	68	47.76±51.15	
Single Leg Stance Test with eyes closed (right side, sec)	Study	70	44.27±60.92	0.591
	Control	68	31.33±29.28	
Single Leg Stance Test with eyes closed (left side, sec)	Study	70	40.47±56.02	0.506
	Control	68	29.44±30.11	
IPAQ-SF	Study	70	894.22±1555.92	0.950
	Control	68	907.28±2011.36	
The Distress Tolerance Scale (DTS)	Study	70	49.02±12.09	0.175
	Control	68	54.14±12.66	
Beck Anxiety Inventory (BAI)	Study	70	32.62±9.77	0.120
	Control	68	30.86±9.68	
Pittsburgh Sleep Quality Index (PSQI)	Study	70	4.98±3.48	0.384
	Control	68	4.39±3.14	
NHP Total Score	Study	70	130.75±104.27	0.140
	Control	68	123.57±88.22	

Abbreviations: BMI. Body Mass Index; IPAQ-SF. International Physical Activity Questionnaire - Short Form; *. $p<0.05$. Statistically significant values are given in bold.

According to the intergroup comparisons, there was a statistically significant increase between the groups in IPAQ-SF, Sit and Reach Test, Push Up Test, Plank Test, LBT, SLST Tests scores ($p<0.05$) (Table 4).

According to the intergroup comparisons, there was a statistically significant decrease between the groups in DTS, BAI, PSQI and NHP scores (except for pain and social isolation subscale scores) (p<0.05) (Table 4).

Table 4. Comparison of outcomes between the groups

	Study Group (n=70)			Within Group p	Control Group (n=68)			Within Group p	Group Difference **p**	Cohen's d
	Pre	Post	**Mean difference %95 CI**		Pre	Post	**Mean difference %95 CI**			
Upper Limb Flexibility Test (cm)	4.4 (6.75)	2.81 (5.76)	-2.40 to -0.75	<0.001**	4.87 (7.68)	4.30 (7.87)	-2.54 to 1.42	0.472	0.163	0.217
Sit and Reach Test (cm)	3.72 (9.32)	-0.44 (6.96)	-5.98 to -2.35	<0.001**	5.07 (18.94)	2.57 (10.36)	-6.80 to 1.80	0.842	0.018*	0.397
Squat Test	31.48 (39.95)	38.17 (45.09)	4.09 to 9.27	<0.001**	28.94 (26.05)	32.20 (16.25)	0.52 to 5.99	0.078	0.353	0.154
Push Up Test	22.58 (21.59)	28.58 (21.31)	4.28 to 7.72	<0.001**	23.61 (14.19)	24.83 (11.38)	0.48 to 6.03	0.313	0.004**	0.502
Plank Test (sec)	65.8 (70.38)	91.45 (80.84)	14.42 to 36.87	<0.001**	54.14 (53.70)	51.63 (37.16)	-1.82 to 4.26	0.732	<0.001**	0.603
LBT (sec)	39.34 (47.75)	54.15 (53.52)	7.68 to 21.93	<0.001**	33.27 (35.82)	30.73 (20.23)	-13.29 to 8.27	0.850	<0.001**	0.611
SLST (R)	81.15 (89.85)	106.34 (101.98)	15.71 to 34.64	<0.001**	50.61 (51.97)	47.38 (43.98)	-10.86 to 5.78	0.822	<0.001**	0.705
SLST (L)	67.72 (77.92)	87.37 (81.85)	3.13 to 36.14	<0.001**	47.76 (51.15)	45.42 (40.38)	-16.82 to 10.36	0.689	0.003**	0.516
SLST eyes closed (R)	44.27 (60.92)	63.31 (67.68)	12.02 to 26.05	<0.001**	31.33 (29.28)	35.39 (33.77)	-15.82 to 11.16	0.234	0.004**	0.493
SLST eyes closed (L)	40.47 (56.02)	59.64 (63.88)	11.56 to 26.77	<0.001**	29.44 (30.11)	32.44 (35.36)	-4.371 to 12.47	0.476	0.008**	0.456
IPAQ-SF	894.22 (1555.92)	6643.09 (15905.69)	2096.74 to 9400.99	<0.001**	907.28 (2011.36)	1030.27 (1202.90)	-112.29 to 363.21	0.152	<0.001**	0.956
DTS	49.02 (12.09)	57.61 (10.75)	6.05 to 11.11	<0.001**	54.14 (12.66)	55.42 (13.60)	-1.04 to 3.58	0.289	<0.001**	0.652
BAI	32.62 (9.77)	26.74 (8.09)	-7.63 to -4.12	<0.001**	30.86 (9.68)	27.36 (8.23)	-3.91 to 0.91	0.063	0.020*	0.403
PSQI	4.98 (3.48)	1.55 (1.09)	-4.12 to -2.71	<0.001**	4.39 (3.14)	5.16 (3.30)	-0.23 to 1.75	0.122	<0.001**	1.189

Abbreviations: LBT; Lateral Bridge Test, SLST; Single Leg Stance Test, R; right side, L; left side,IPAQ-SF. International Physical Activity Questionnaire-Short Form; DTS, The Distress Tolerance Scale; BAI, Beck Anxiety Inventory, PSQI, Pittsburgh Sleep Quality Index; *. p<0.05; **. p<0.001. Statistically significant values are given in bold.

Discussion

This study is the first randomized controlled study examining the effectiveness of a video-based physical exercise program in healthy young adults. It shows that an exercise program has significant effects on physical activity, physical fitness, depression-anxiety, quality of life and sleep quality in young adults.

The Covid 19 pandemic and curfews and their accompanying psychological distress and physical inactivity have had negative effects on health all over the world[20]. This study evaluated the physical activity level of 645 people andfound that time spent sedentary increased with the Covid

19 pandemic[21]. Mascarhencas et al. reported that to increase physical activity in healthy mothers with at least 1 child under the age of 12, a group exercise intervention using video conferencing and mobile applications was an appropriate and acceptable method to direct them to physical activity[22]. Similarly, our study leads us to think that video exercise applications are effective in increasing physical activity, with exercises in visual input and sequential flow contributing to this effect.

Physical Fitness (Flexibility/Strength/Balance/Postural Control/Stability)

Being physically active and reducing sedentary behavior during the COVID-19 pandemic, maintaining physical fitness levels, improving and maintaining physical balance and developing various physical values are essential for overall health and promote a better quality of life.

Many studies show that physical activity level is closely related to physical fitness parameters. A study examining the relationship between physical activity and health-related physical fitness in young people demonstrated positive correlations between physical activity and physical fitness in both boys and girls[23]. In their study to determine the effect of tele-rehabilitation (TR) programs on exercise capacity, glucose control, psychosocial status, physical fitness, and muscle strength in patients with type 2 diabetes (DM), Durutürk et al. observed significant improvements in the telerehabilitation group in all parameters evaluated usingthe6-minute walking test, physical fitness and muscle strength dynamometer measurement, and the BDI[24]. This study's program consisted of exercises made difficult and applied in 3 phases in 2-week periods to ensure progression in physical fitness. As a result, significant differences were shown between the groups in all physical fitness parameters except upper extremity flexibility and squat test.

During the COVID-19 outbreak in over 60 countries, it is clear that young people have been more vulnerable to stress, anxiety, and depression[25]. A study conducted by Qi et al. that included 1171 participants showed that the general prevalence of depression and anxiety symptoms in the population was 22.6% and 21.4%, respectively, and stated that regular exercise was a potential protective factor. The prevalence of depression and anxiety symptoms was found to be significantly associated with insomnia symptoms and negative feelings about the pandemic[26]. Considering that physical inactivity has not only physical but also psychological effects, the implementation of the physical activity program, especially during the period of restriction, was effective in reducing symptoms of anxiety and depression. We think that this is due to the effect of exercise on the autonomic system; studies have shown that regular exercise is associated with less hypothalamic-pituitary-adrenal axis reactivity and sympathetic nervous system. There is strong evidence from animal studies that exercise positively affects the pathophysiological processes of anxiety[27].

According to the available evidence in the systematic review of the literature by Bailey et al., the specific characteristics of interventions required to improve anxiety in adolescents and young adults aged 12-25 years[28] remain unclear, yet the review showed that supervised aerobic-based exercise with moderate to vigorous-intensity several times a week for eight or more weeks had a positive effect. Garijo et al. reported that a telerehabilitation program based on aerobic exercise achieved improvements in intensity, pain, and psychological distress compared to a control group in social isolation due to the COVID-19 pandemic. Although the program we applied to individuals in social isolation lasted for a shorter time than others in the literature, we think that the positive effects on resilience against anxiety that we found stem from physical activity with visual input and motivation and the interaction of individuals, albeit remotely.

The COVID-19 outbreak is closely related to anxiety, depression, stress, and sleep disorders[29]. It has been proven in many studies that physical activity and exercise have significant effects on sleep and related parameters. The meta-analysis of Kelley et al[30] stated that regular exercises have positive effects on factors such as general sleep quality, global score, subjective sleep, and sleep delays in adults. The fact that the results of our study have a positive impact on PSQI, in line with the literature, might be due to the physiological changes resulting from doing exercise, as shown in other studies. According to other studies conducted, physical activity (whether face-to-face or video-based) increases parasympathetic nervous system control, increases autonomic functions; reduces heart rate; increases GH hormone secretion in the endocrine system; and may improve sleep parameters.

A study reporting a decreased level of physical activity among adults during the COVID-19 pandemic, accompanied by decreased health-related quality of life and increased stress levels, draws significant correlations between physical activity participation, quality of life, and perceived stress levels. Study results show that physical activity has been effective in reducing stress and improving quality of life during the pandemic[26].

For patients with lower back pain, exercise intervention has been shown to improve quality of life Park et al.[31] reported that lower back exercises delivered through web-based videos have the same effects on patients with lower back pain, whether they are middle-aged or elderly, and that the quality of life increased more for the elderly compared to the middle-aged.

The study of Türkmen et al. stated that the video-based program is an effective option in terms of shoulder functionality, pain, range of motion, and quality of life[32]. Similar to the reports in the literature, this study observed that video exercise had a significant effect on total quality of life score. When the subgroups were examined separately, no difference was found between groups along the subscales of pain, emotional reaction, and social isolation. The fact that the individuals participating in our study were healthy may explain that there was no difference in pain scores. The "Cave Syndrome," which came to the fore with the Covid-19 pandemic, is defined as an unwillingness to participate in social life despite vaccination[33]. This syndrome grew during the pandemic process. One-to-one human communication was not included in the exercise program we applied, and watching the video recordings alone may not have affected social isolation subscales.

This study had some limitations. Online evaluations of the participants, a necessity of the pandemic, were the first. Another was the fact that the scarcity of methods with proven validity and reliability in telemedicine necessitated evaluations that the participants could make themselves. A third fault was the advancement of participants to a higher level of exercise in 2-week periods without re-evaluating them in their progression through the exercises. Finally, the age of the participants in our study was mostly between 25-27, and there was a difference between the groups in terms of gender. These issues can be taken into account in future studies. We recommend future studies use methods with proven validity and reliability in telemedicine and include all physical fitness parameters with synchronized interventions performed in the presence of a physiotherapist.

Conclusion

Although tele-rehabilitation and video-based game console applications are common in patient and child populations, there are no studies investigating their effects on young adults in the literature. Our study contributes new and original research to the literature by investigating the effectiveness of home-based exercise programs delivered via video to healthy young adults. We think that our findings will shed light on the management of the rehabilitation process by contributing to the increasing evidence in the literature on the effectiveness of video-based exercises and improving health-related multifaceted parameters in various post-pandemic situations where access to health services and preventive rehabilitation is restricted.

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