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INVESTIGATION OF PHYSICAL ACTIVITY, SLEEP QUALITY, ANXIETY AND DEPRESSION LEVELS AMONG EXERCISER AND NON-EXERCISER ADULTS IN THE COVID-19 PANDEMIC

ORIGINAL ARTICLE

ABSTRACT

Purpose: To assess physical activity (PA), perceived exercise benefits, perceived sleep quality, anxiety and depression levels of adults who exercised and did not exercise during the pandemic.

Methods: 1226 voluntary participants who lived in the community (age range 18-55 years) were included in this cross-sectional study. Demographic information was recorded, and exercise motivators and barriers were evaluated through questions prepared by the researchers. PA levels [International Physical Activity Questionnaire-Short Form (IPAQ-SF)], perception about the benefits of exercise [Exercise Benefits and Barriers Scale-Benefits Subscale (EBBS-BS)], sleep quality [Pittsburgh Sleep Quality Index (PSQI)], and anxiety and depression levels [Hospital Anxiety and Depression Scale (HADS)] were assessed.

Results: There were statistically significant differences in scores of IPAQ-SF, PSQI, EBBS-BS, and HADS between those who did and did not exercise ($p<0.001$). Fifty-two percent of the participants had low PA levels during the pandemic. It was found that the main motivating factor of exercise was to improve performance and/or strength (81.54%), and the main barrier was preferring to do other things (lack of motivation) (84.8%).

Conclusion: Those with low PA levels have worse anxiety, depression, and poor sleep quality. Knowing the motivators and barriers of PA can guide the determination of intervention and prevention strategies.

Keywords: Anxiety, Covid-19, Depression, Physical Activity, Sleep

COVID-19 PANDEMİSİNDE EGZERSİZ YAPAN VE YAPMAYAN YETİŞKİNLERİN FİZİKSEL AKTİVİTE, YAŞAM KALİTESİ, ANKSİYETE VE DEPRESYON DÜZEYLERİNİN İNCELENMESİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Pandemi sırasında egzersiz yapan ve yapmayan yetişkinlerin fiziksel aktivite (FA), algılanan egzersiz yararları, uyku kalitesi, anksiyete ve depresyon düzeylerini değerlendirmektir.

Yöntem: Kesitsel tipteki bu çalışmaya, toplumda yaşayan (18-55 yaş aralığı) 1226 gönüllü katılımcı dahil edildi. Demografik bilgiler kaydedildi ve araştırmacılar tarafından hazırlanan sorularla egzersiz motivatörleri ve bariyerleri değerlendirildi. FA seviyeleri [Uluslararası Fiziksel Aktivite Anketi-Kısa Form UFAA-KF)], egzersizin yararları hakkında algı [Egzersiz Faydaları ve Engeller Ölçeği-Faydalar Alt Ölçeği (EFEÖ-FÖ)], uyku kalitesi [Pittsburgh Uyku Kalitesi İndeksi (PUKİ)], anksiyete ve depresyon düzeyleri [Hastane Anksiyete ve Depresyon Ölçeği (HAD)] değerlendirildi.

Sonuçlar: Egzersiz yapan ve yapmayanlar arasında UFAA-KF, PUKİ, EFEÖ-FÖ ve HAD skorlarında istatistiksel olarak anlamlı fark vardı ($p<0,001$). Katılımcıların %52'si pandemi sırasında düşük FA seviyelerine sahipti. Egzersizin ana motive edici faktörünün performansı-gücü artırmak (%81,54) ve ana bariyerinin ise başka şeyler yapmayı tercih etmek (motivasyon eksikliği) (%84,8) olduğu bulundu.

Tartışma: Düşük FA seviyelerine sahip yetişkinlerin anksiyete, depresyon ve uyku kalitesi skorları daha kötüydü. FA'nın motive eden faktörlerini ve bariyerlerini bilmek, müdahale ve önleme stratejilerinin belirlenmesine rehberlik edebilir.

Anahtar kelimeler: Anksiyete, Covid-19, Depresyon, Fiziksel Aktivite, Uyku

INTRODUCTION

Coronavirus disease 2019 (COVID-19) spread rapidly among countries and was declared a pandemic by the World Health Organization in March 2020 (1). Due to the high transmission rate of COVID-19, the general population has become anxious and fearful, and positively diagnosed people have experienced physical and emotional isolation in addition to stress or insomnia (2). The current extraordinary situation of the world, changing the daily routines of people, and being away from social life, negatively affected the mental health such as sleep quality, anxiety and depression levels of individuals (3).

The health benefits of adequate or more physical activity (PA) have irrefutable evidence for improving physical, psychological, and social conditions (4). PA has beneficial effects on sleep quality and contributes to the prevention of chronic diseases, reduces anxiety, and depressive symptoms (5, 6). Thus, factors affecting PA such as exercise habits, attitudes toward exercise, and current motivational conditions may change the perception of exercise benefits, sleep quality, anxiety, and depression levels of individuals in the COVID-19 pandemic.

Various motivators and barriers were reported in different populations for the participation of PA because the age of the individual is an important factor to consider when developing programs to promote PA (7). Losing or maintaining weight was reported as the main motivator for physically active adults, and a lack of time was reported as the most frequently barrier for inactive adults (7). These motivators and barriers vary according to sociodemographic characteristics, perception of exercise, and general health status (8). The pandemic brings a new and extraordinary lifestyle for every individual, and the question of how motivators and barriers have changed due to factors such as social isolation, and health-related concerns comes to mind. The pandemic primarily affected individuals' lifestyles, such as participation in PA and sedentary behavior (1, 9). Many motivators and barriers may have caused this lifestyle. Although lack of motivation and lack of appropriate facilities/equipment/space are shown as barriers to the emergence of these behaviors, studies evaluating both motivators and barriers for adults are limited in the literature. In addition, although there are some studies investigating PA, sleep quality, anxiety, and depression levels during the pandemic period, there is no study revealing their findings among exerciser and non-exerciser adults.

The primary aim of this study was to assess the perception of exercise benefits, sleep quality, and anxiety and depression level of individuals who did and did not do exercise during pandemic. Another aim was to evaluate PA levels and to determine motivators and barriers to PA of adults who were isolated due to COVID-19.

METHODS

Study Design

This cross-sectional study was conducted between April 2020 and May 2020 via an online form created by the researchers. The voluntary participants answered the questions regarding motivator and barrier factors about their exercise habits and continuousness of exercise, perception of exercise benefits, PA level, sleep quality, and emotional status. The research protocol was conducted in accordance with the Declaration of Helsinki. Informed consent was received from all participants before their enrollment into the study. The protocol of this study was registered to a clinical trials database (clinicaltrials.gov) (NCT04339491) and this study was granted by the Istanbul Bilgi University Human Research Ethics Committee (2020-40030-52).

Sample

The calculation of the sample size was carried out with a 95% confidence level and a 5% of precision, the expected proportion of the change in population was 0.5. Since Turkey's population is more than 100.000, according to these values, as the sample size should be at least 400 people (10).

The sample selection was made using the convenience sampling strategy method. The study sample consisted of people living in urban areas and who have internet access, who were respondents of posting invitations through social media and e-mail during the early period of coronavirus restrictions imposed in the country. The lockdown

measures were enforced by the government for the entire country starting from March 11th 2021 (11).

Participants reached the self-administered questionnaires online. Before proceeding to the questionnaires, in the first part of the study, the participants were given information about the research. Individuals who lived in the community with an age range of 18-55 years were included. Participants were excluded if they self-reported the following conditions; visual or auditory impairment, cardiorespiratory insufficiency, orthopedic, rheumatologic and neurological disease that prevented the participation of exercise; or if they could not communicate in the native language.

Participants were asked to confirm that they met these criteria and voluntarily participated in the study. Two thousand eleven people were reached during initial contact, and 39.2% of these people refused to participate in the study. One thousand two hundred twenty-two participants completed the questionnaire. Sixteen individuals' data were excluded because of missing data.

Outcomes

To collect the data, a survey was administered with questions about several demographic variables such as age, sex, education, smoking habits, chronic diseases, and working status in the pandemic period and motivators of and barriers to PA. The participants were questioned about their exercise habits during the pandemic and were separated into two groups as those who exercised during the pandemic (group 1) and those who did not (group 2). Also, they were questioned about whether they exercised regularly before the pandemic (defined as exercising for 30 min or longer, twice per week or more frequently for at least 1 year) (12).

PA Level: International Physical Activity Questionnaire-Short Form (IPAQ-SF) which was developed by Craig et al. (2003) (13), was used to assess the PA level of participants. The IPAQ-SF includes seven items and assesses the activity type, frequency (days), and duration (h) of various activities. PA scores are estimated using the calculated total metabolic equivalent task (MET). After the calculation of total MET scores, PA level of participants was divided into three categories as low (0-600 MET-minutes/week), moderate (600-3000 MET-minutes/week) and high (3000 MET MET-minutes/week and above) (13). The Turkish version of IPAQ-SF has shown to be a reliable and valid questionnaire by Sağlam et al. (2010) (14).

Perception of Exercise Benefits: The Exercise Benefits and Barriers Scale-Benefits Subscale (EBBS-BS) was used to assess the perception of exercise benefits in this study. The EBBS-BS consists of 29 items. Higher scores indicate the individual's feelings of stronger positive benefits of exercise. The Turkish adaptation and reliability of EBBS-BS, which was developed by Sechrist et al. (1987), have been reported by Ortabağ et al (15, 16).

Sleep Quality: The Pittsburgh Sleep Quality Index (PSQI), developed by Buysse et al. (1989), was used to evaluate sleep quality (17). The Turkish validity and reliability of the PSQI has been studied by Ağargün et al. (1996) (18). The PSQI consists of 19 questions or items. A global score ≥5 indicates clinically impaired sleep quality.

Anxiety and Depression: The Hospital Anxiety and Depression Scale (HADS) was developed by Zigmond and Snait (1983) (19). The Turkish version of HADS, which, 14-item descriptive and self-report questionnaire. HADS is divided into an anxiety subscale (HADS-A) and a depression subscale (HADS-D). Higher scores indicating greater frequency and severity of symptoms of anxiety and depression (20).

Motivators and Barriers: The motivators and barriers to PA were evaluated with items that have already been investigated and shown to significantly affect PA levels in previous studies (8, 21-23). The items, having been used to investigate motivators and barriers to exercise of the participants, were provided as Appendix A.

The permissions were obtained for using Turkish versions of all questionnaires.

Statistical Analysis

The Statistical Package for the Social Sciences 22.0 (SPSS Inc., Chicago, IL, USA) program was used for all statistical analyses. The descriptive statistics (mean, standard deviation, skewness, kurtosis) and Shapiro–Wilk's test were used for testing the assumption of normality. The data

were not normally distributed, thus nonparametric tests were used for statistical analysis. Descriptive statistics (mean, frequency, and percentage) were used to describe the demographic characteristics of the participants. Variables were compared between the groups using the Mann-Whitney U test for continuous variables and the Chi-square test for categorical data. The significance level was set at $p<0.05$.

RESULTS

A total of 1206 participants were included in the study (group 1: n=428; group 2: n=778). The demographic and clinical features and comparisons of the groups are presented in Table 1. No differences were found in terms of education, chronic disease, days of isolation, and the working status between the groups (p=0.166, p=0.163, p=0.06, p=0.115 respectively). There were differences in terms of age, sex, body mass index (BMI), smoking status, and doing regular exercise before the pandemic between the groups (p<0.001) (Table 1).

There were statistically significant differences in the scores of IPAQ-SF, PSQI, EBBS-BS, HADS depression (p<0.001) and HADS anxiety (p=0.004) between group 1 and group 2. All parameters were found to be higher in group 2, except for the score of IPAQ-SF (Table 2).

The most prevalent motivator for exercisers (group 1) was to improve performance and/or strength (81.5%) and the most prevalent barrier for non-exercisers (group 2) was to prefer to do other things (lack of motivation) (84.8%). The exercise motivators of group 1 and exercise barriers of group 2 are presented in Table 3.

The participants in both groups were investigated according to their exercise habits during and before the pandemic (Table 1). In group 1, 54.7% (n=234) of the participants were found to already have regular exercise habits and continued to exercise during the pandemic, and 45.3% of the participants (n=194) had not exercised before and started exercising during the pandemic restrictions (at least for 4 weeks). In group 2, 22% of the participants (n=171) stopped exercising during the pandemic

Table 1. Demographic and Clinical Features of the Participants

	Total (n=1206)	Group I (n=428)	Group II (n=778)	p
Age (years) Mean (SD)	27.23 (6.89)	26.19 (6.14)	27.80 (7.22)	**<0.001***
BMI (kg/m^2) Mean (SD)	23.41 (3.89)	22.78 (3.67)	23.74 (4.05)	**<0.001***
Sex n (%)				
Female	759 (62.9)	300 (70.1)	459 (59.0)	**<0.001****
Male	447 (37.1)	128 (29.9)	319 (41.0)	
Education, (≤ High school / > High school) n (%)	384 (31.8)/822 (68.2)	147 (34.3)/281 (65.7)	237 (30.5)/541 (69.5)	0.166**
Smoking Status (Y/N) n (%)	300 (24.9)/906 (75.1)	82 (19.2)/346 (80.8)	218 (28.0)/560 (72.0)	**<0.001****
Chronic Disease (Y/N) n (%)	115 (9.5)/1091 (90.5)	34 (7.9)/394 (92.1)	81 (10.4)/697 (89.6)	0.163**
Isolation (days) Mean (SD)	20.60 (7.93)	21.29 (7.13)	20.22 (8.32)	0.06*
Work Status During the Pandemic n (%)				
No change	110 (9.1)	35 (8.2)	75 (9.6)	
Work at home	422 (35.0)	163 (38.1)	259 (33.3)	
Less than before the pandemic	152 (12.6)	43 (10.0)	109 (14.0)	0.115**
e-Learning	522 (43.3)	187 (43.7)	335 (43.1)	
Regular Exercise Before the Pandemic, n (%)	405 (33.6)	234 (54.7)	171 (22.0)	**<0.001****
Frequency (days), Mean (SD)	3.71 (1.33)	3.81 (1.38)	3.57 (1.24)	
Time (minutes), Mean (SD)	62.37 (27.98)	59.70 (28.61)	66.02 (26.74)	
Duration (months), Mean (SD)	15.11 (26.47)	14.81 (24.13)	15.53 (29.44)	

***p*<0.05,** SD: Standard Deviation, n (%): Number (Percent), Y/N: Yes/No, BMI: Body Mass Index, *: Mann-Whitney U Test, **: χ^2 Test

Table 2. Physical Activity, Sleep Quality, Perception of Exercise Benefits, Anxiety and Depression Scores of the Participants

	Group I (n=428)	Group II (n=778)	p
IPAQ-SF (total MET), Mean (95% CI)	1793.75 (1654-1933)	773.97 (661-886)	**<0.001***
IPAQ-SF (category), n (%)			
Low-active	86 (20.1)	547 (70.3)	**<0.001****
Moderate	168 (39.3)	176 (22.6)	
High-active	174 (40.7)	55 (7.1)	
EBBS-BS (total score), Mean (95% CI)	48.12 (47-49)	55.54 (54-56)	**<0.001***
PSQI (total score), Mean (95% CI)	4.23 (3.99-4.47)	5.14 (4.94-5.34)	**<0.001***
HADS (anxiety score), Mean (95% CI)	7.85 (7.45-8.24)	8.67 (8.35-8.99)	**0.004***
HADS (depression score), Mean (95% CI)	6.26 (5.93-6.59)	7.94 (7.66-8.21)	**<0.001***

***p*<0.05,** IPAQ-SF: International Physical Activity Questionnaire Short Form, MET: Metabolic Equivalent Threshold, PSQI: Pittsburgh Sleep Quality Index, EBBS-BS: Exercise Benefits and Barriers Scale-Benefits Subscale, HADS: Hospital Anxiety and Depression Scale, *: Mann-Whitney U Test, **: χ^2 Test

Table 3. Exercise Motivators/Barriers of the Groups

Group I Exercise motivators	n (%)	Group II Exercise barriers	n (%)
improve performance and/or strength	349 (81.5)	prefer to do other things (lack of motivation)	660 (84.8)
lose or maintain weight	315 (73.6)	lack of money	225 (28.9)
avoid or manage a health condition	286 (66.8)	lack of enjoyment	147 (18.9)
improve mood	132 (30.8)	nobody to exercise with	134 (17.2)
improve appearance	72 (16.9)	lack of confidence	130 (16.7)
		lack of time	98 (12.5)
other	13 (3.0)	other	32 (4.1)

%: percent, n: Number of participants

restrictions (at least for 4 weeks) although they had a habit of exercising regularly before the pandemic, while the 78% (n=607) had not exercised before and or during the pandemic. The most essential motivators for participants who had exercise habits and continued to exercise were to improve performance and/or strength (82.1%), lose or maintain weight (66.2%), and improve mood (64.9%). The most essential motivators for participants who did not exercise before but started exercising with the pandemic restrictions were as follows: to lose or maintain weight (82.5%), avoid or manage health conditions (76.2%), and improve performance and/or strength (66%). The most common barriers for the participants who stopped exercising were the preference to do other things (lack of motivation) (79.5%), lack of money (57.3%), and lack of confidence (24%). The common barriers for participants who did not exercise before or during the pandemic were as follows: the preference to do other things (lack of motivation) (86.3%), lack of time (22.8%), and lack of money (20.9%).

DISCUSSION

The findings of the current study indicated that PA levels and sleep quality were higher, and anxiety and depression levels were lower in individuals who exercised. It was found that about half of the participants had low PA levels in the pandemic. The most prevalent motivator for individuals who exercised even during the pandemic was to improve performance and/or strength, and the most prevalent barrier was the preference to do other things (lack of motivation) for individuals who did not do

exercise in this period.

In this research, although age and BMI were significantly different between the groups, it was observed that the participants in both groups were similar age range and were in the normal weight range in terms of BMI. In a systematic analysis investigating smoking prevalence (22), it was reported that the majority of the smokers were men. Similarly, the difference in smoking status between the groups may be due to the larger male population of group 2 (41.0%) than in group 1 (29.9%). Also, a high rate of 'avoiding or managing health condition' motivators in participants who exercised (group 1) may have related to low smoking behavior. The work status of participants in the two groups was found to be similar. It could be suggested that there was no association between working status and PA levels. In addition, because the participants were young adults, the percentage of chronic diseases was low in both groups.

It was shown that PA levels decreased during the COVID-19 outbreak period (24). In this study, 52% of the participants were found to have low PA levels. The majority of those who did not exercise during the pandemic stated that they did not exercise regularly before the pandemic (78%), and 22% of the participants stopped exercising during the pandemic restrictions. Therefore, in line with other studies (1, 9, 24), it can be concluded that besides the sociodemographic and lifestyle characteristics of the population, the COVID-19 outbreak negatively affected the PA levels of healthy adults. As expected, the PA level of participants who exercised was found to be significantly higher than in the non-exercising group. Moreover, most of the participants who exercised were in the high-active category, and most of the non-exercising participants were in the low-active category. This is probably a consequence of the fact that exercises performed regularly were included in moderate-vigorous PA.

Interestingly, when we looked at our findings, we found that those who did not exercise had higher EBSS scores than those who did. In other words, although they knew the benefits of exercise, they did not do exercise, and their PA levels were low. Although the opposite was expected, finding such a result led us to conclude that knowing the benefits of exercise might not be sufficient for exercise behavior. As Williams and French concluded, exercise habits can be acquired using behavioral models that include a specific goal, motivation, and time management (25).

Regardless of other factors that may affect sleep, exercise has been proved to have a positive effect on sleep in the short and long term (5). The current study showed that individuals who exercised had higher sleep quality scores. We also found that participants who exercised had lower anxiety and depression scores. The difference in sleep quality, anxiety and depression scores between the "exerciser group" and "non-exerciser group" may have resulted from the positive effects of doing exercise or the negative effects of stopping exercising. In the non-exerciser group, there were individuals who stopped exercising even though they had exercise habits, at a rate of almost one fourth. It was stated that the measures taken during the pandemic had a significant differential effect, particularly on participants who were physically active before and experienced a significant decline in their PA levels, sleep quality, and well-being; there were no significant changes in physically inactive participants (24). Although our study is unable to determine causality of the significant difference due to its design, this finding is important in terms of emphasizing the relationship between exercise and these mental health-related factors, whether it is due to the positive effect of doing exercise or the negative effect of stopping exercising.

According to our findings, for participants who continued to exercise during the pandemic and for participants who started exercising, the most prevalent motivators were related to physical performance and body weight. Differently, the other motivator was to improve mood for participants who continued, and motivators about health conditions were some of the essential motivators for participants who started exercising. Marashi et al. (2021) reported that participants who stayed active during the pandemic were more motivated by mental health outcomes and less motivated by physical health outcomes (23). In line with this finding, individuals in our study who seemed motivated for PA were also intrinsically motivated for well-be-

ing during COVID-19 restrictions.

Barriers to participation in PA are affected by the inter-relations between the individuals and their social and physical environments. Our findings show that it is possible to define the preference to do other things (lack of motivation) and lack of money as the most prevalent barriers to PA during the pandemic. Hoare et al. (2017) found that lack of time was the most frequent reported barrier to PA in the adult population before the pandemic (8). Based on our results, the lack of time for exercise was the sixth most reported barrier during the pandemic. In this period, working from home or continuing education as e-Learning may have enabled more time for people and may have lessened the lack-of-time barrier. Barriers, such as lack of motivation are related to an individual's psychological factors. Stults-Kolehmainen and Sinha (2014) reported that people try to engage in less strenuous activities and avoid exercising during stressful times (26). Therefore, psychological support could help people to overcome perceived barriers to be physically active during stressful times such as the pandemic.

The lack of motivation was the most prevalent barrier for participants who did not do exercise before or now and who stopped exercising, but the second-ranked barrier varied. For the participants who stopped exercising, the second main barrier was lack of money. Lack of appropriate facilities or equipment at home may create a cost problem for these people. This study did not question the participants' exercise environment preferences or how they exercised before the pandemic. To eliminate this barrier, it may be beneficial to gain awareness that exercise can also be properly done at home with simple and inexpensive equipment. On the contrary, for the participants who did not do exercise before or now, the second main barrier was lack of time. For these physically inactive participants, as mentioned above, because there were no significant changes in PA levels, lack of time was one of the main barriers, in line with pre-pandemic research (8).

Despite the strength of the study, the large population size, and its timely assessment of PA and mental health behaviors, the evaluation of PA levels with a self-reported method, statistical difference in mean age between the groups although very similar, and the inability to determine causality due to the cross-sectional nature of the design can be taken as a limitation. The assessment of intensity and volume of PA was not considered in the pre-pandemic period, and the subjective measurement of the motivators of and barriers to PA also places a limitation.

The present study demonstrated that although our participants belonged to a younger population, their PA levels were low both before and during the pandemic. Also, our results suggest that those with low PA levels have significantly worse anxiety, depression, and poor sleep quality. Despite the presence of several factors associated with PA, the major motivator and barrier of PA during the pandemic were improved performance and/or strength and lack of exercise motivation, respectively.

The findings of this study are important in terms of showing that exercising is associated with less exposure to these negative mental health disturbances during the COVID-19 pandemic. Accordingly, exercise can be considered as part of strategies to cope with factors (such as poor sleep, higher anxiety, and depression scores) that occur during the pandemic. Adherence to PA can be affected due to changes in living conditions, so individuals' exercise motivators and barriers must be questioned by healthcare professionals for increasing PA.

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