COVID-19 Fear and COVID-19 Anxiety as Predictors of Exercise Benefit-Barrier Perception in Type 2 Diabetes Patients in the COVID-19 process

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COVID-19 FEAR AND COVID-19 ANXIETY AS PREDICTORS OF EXERCISE BENEFIT-BARRIER PERCEPTION IN TYPE 2 DIABETES PATIENTS IN THE COVID-19 PROCESS

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Abstract

Background: Exercise is an important building block in the management of type 2 diabetes. Perceptions of benefits and barriers related to that behavior may affect individuals' tendency towards protective behaviors such as exercise.

Aim: The aim of this study was to examine the fear of COVID-19, anxiety of COVID-19 and descriptive features as predictors of exercise benefit-barrier perception in type 2 diabetes patients during the COVID-19.

Method: The research sample consisted of 161 patients with type 2 diabetes. Patient diagnosis form, Exercise Benefits-Barriers Scale, Coronavirus (COVID-19) Fear Scale (CFS) and Coronavirus Anxiety Scale (CAS) were used as data collection tools. The data was shown as percentage and mean ± standard deviation (SD), and Pearson/Spearmen correlation and linear regression analyses were used to examine the relationship between the variables.

Results: In the study, when asked what the biggest barrier to exercising as a person with diabetes was, 38.31% of the individuals with type 2 diabetes said "COVID-19 pandemic". The total exercise benefit perception of individuals with diabetes was significant (F: 17.873, p<.001). In addition, for the perception of total exercise benefit, paying attention to risky situations (Hypoglycemia or hyperglycemia preventive behaviors) before doing physical activity (β = -.384), development of diabetic foot in the last six months (β =.163), COVID-19 anxiety (β =.205) were found to be statistically significant predictors (p<.001).

Conclusion: At the end of the study, it was found that illiteracy, having a history of diabetic foot development in the last six months, being married and an increase in the level of COVID-19 anxiety increased the perception of exercise benefit in individuals with Type 2 diabetes.

Keywords: Anxiety, benefit perception, COVID-19, exercise, fear, type 2 diabetes.

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INTRODUCTION

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus, and it spread all over the world in a short time, causing severe acute respiratory syndrome. COVID-19 was declared to be a pandemic by the World Health Organization as it spread almost all over the world, and it was seen in thousands of people causing thousands of them to die.[1] It is pointed out that male patients at older age and with chronic diseases such as "cardiovascular disease (CVD), obesity and/or type 1 diabetes mellitus (T1DM) or type 2 diabetes mellitus (T2DM)" are at high risk of severe COVID-19 or death.[2] Type 2 diabetes is one of the most common chronic diseases in the world.[3] It is reported that the COVID-19 process of individuals with type 2 diabetes has many negative effects on their psychosocial, behavioral and health status.[4,5] Type 2 diabetes is a chronic disease that requires continuous medical care and continues for life, in which the organism cannot make use of carbohydrates, fats and proteins sufficiently due to insulin deficiency or absence.[3] For type 2 diabetes management, insulin therapy, oral antidiabetic use, medical nutrition therapy and diabetes self-management education as well as physical activity are recommended.[6] In general, diabetic patients are recommended to do moderate-to-vigorous brisk walking exercise for at least 150 minutes a week and for more than 48 hours without a break.[6,7] During the COVID-19, quarantine practices were implemented in many countries to prevent the spread of the virus and to reduce the death rates.[8] However, both the ignorance of the COVID-19 process and the quarantine practices applied caused many negative effects on the psychosocial, behavioral and health status of individuals with type 2 diabetes.[9-11] Individuals with type 2 diabetes; They have become vulnerable with the psychological stressors brought by the pandemic, such as quarantine, social distance and fear of contamination.[12] During the C0VID-19 epidemic, individuals with Type 2 diabetes were in home isolation, causing patients to engage in inadequate activity. It is widely known that physical activity is an effective method of reducing anxiety levels. However, considering the possibility of patients' anxiety increasing during the epidemic process, anxiety is an undesirable situation in the management of the treatment of the disease for this patient population. In addition, the fact that the disease becomes difficult to manage during the epidemic and individuals experience anxiety due to not being able to control it is also a risk factor.[13] In the study examining the relationship between loneliness, physical activity and mental health with depression and anxiety in adults over the age of 50 during COVID-19, it was stated that loneliness and decreased physical activity levels were associated with poor mental health and anxiety during the pandemic. The case study shows that physical activity may be closely linked to mental health, particularly anxiety.[14] In studies examining the effects of quarantine practices applied during the COVID-19 on patients with diabetes, it was found that 87% of individuals with type 2 diabetes experienced mental stress during quarantines;[9] that one-third of individuals failed to follow the recommended diet plans and reduced their consumption of fruits and vegetables;[10] that approximately two-thirds of individuals experienced fear/anxiety about COVID-19;[10] and that the COVID-19 process negatively affected the quality of life and the demand for health care and increased risky behaviors.[4] In terms of physical activity status in the COVID-19 process, in one study, two-thirds of individuals with diabetes did not engage in physical activity,[10] while in other studies, it was seen that there was a 10%[4] or 2.5-fold[1] decrease in physical activity rate. In a study conducted in Turkey, it was revealed that 46.5% of individuals with diabetes did not exercise regularly at home.[15]

One of the main reasons for the increase in the number of patients with diabetes is known as sedentary life. The facilitator aspect of physical activity in coping with diabetes (keeping blood glucose levels balanced) makes it important to examine the perceptions of individuals with Type 2 diabetes regarding the obstacles or benefits of physical activity during the COVID-19 epidemic.

METHODS

Research Type

This study was conducted using the cross-sectional descriptive research type. The cross-sectional descriptive research type was chosen in this study as it is a research method in which the relationship between cause and effect can be examined together in a certain time period.

Aim

In line with the data to be obtained at the end of this study, this is thought to help develop strategies on how to improve the physical activity adaptation of individuals with type 2 diabetes. No research could be found on the level of fear and anxiety of COVID-19 in individuals with type 2 diabetes during the pandemic or on how the fear and anxiety experienced affect the perception of benefit-barrier for physical activity. The aim of this study was to examine the fear of COVID-19, anxiety of COVID-19 and descriptive features as predictors of exercise benefit-barrier perception in type 2 diabetes patients during the COVID-19. The research questions directed in the study were as follows;

Research Questions

1. Is there a change in the perception of exercise benefit-barrier in patients with Type 2 diabetes during the COVID-19?

2. Is there a relationship between the perception of exercise benefit-barrier and COVID-19 anxiety in patients with Type 2 diabetes during the COVID-19?

3. Is there a relationship between the perception of exercise benefit-barrier and fear of COVID-19 in patients with Type 2 diabetes during the COVID-19?

4. Is there a relationship between the perception of exercise benefit-barrier in patients with Type 2 diabetes during the COVID-19 and their socio-demographic characteristics (age, gender, educational background, and so on)?

5. Is there a relationship between the perception of exercise benefit-barrier in patients with Type 2 diabetes during the COVID-19 and the disease-related characteristics of the patients (diabetes duration, type of treatment, and so on)?

Research Setting and Time

The study was carried out in the diabetes education center of a university hospital between 1 September and 3 December 2021. A nurse with a Diabetes Nursing Certificate was working at the diabetes education center. Patients examined by the doctor were directed to the diabetes education center to receive education and counseling about diabetes. This center was a place where patients with newly-diagnosed diabetes received education and counseling for diabetes treatment and management in the process. In addition to individual training, group training was also provided at this center.

Research Sample

Without using any sampling method, the research sample included 161 individuals with type 2 diabetes who applied to the diabetes education center on the specified dates and met the inclusion criteria of the study. The inclusion criteria in the study were as follows: being between 18 and 65 years old, having no vision and hearing problems, having no cognitive and psychiatric problems, having no diagnosis of malignancy, being non-pregnant, being diagnosed with type 2 diabetes within the last year for at least 6 months, having arterial blood pressure of systolic ≤ 160 mmHg and diastolic ≤ 100 mmHg, received basic diabetes education, having no disability to exercise, and volunteering to participate in the study. Individuals who did not meet these criteria were excluded from the study.

In this study, G*powersoftware, version 3_1 was used for the calculation of the sample size.[16] At the end of the study, according to the post hoc linear regression analysis, when the number of predictor variables was 17, the effect size was 0.15; the sample size was 161 and p=0.05; and the power of the study was .85.

Data Collection Tools

As the data collection tools applied in the study, descriptive features form, Exercise Benefits-Barriers (Scale, and COVID-19 fear and COVID-19 anxiety scales were used.

Descriptive Features Form: It was a form created by the researchers after reviewing the related literature.[9-11,17,18] The form consisted of two parts. The first part was related to the socio-demographic characteristics of the individuals with type 2 diabetes, and the second part addressed the situations related to type 2 diabetes.

Exercise Benefits-Barriers Scale:

This scale was developed by Sechrist, Walker, and Pender in 1987.[19] The validity and reliability of this scale in Turkey was conducted by Ortabağ and colleagues.[20] The exercise benefit/barrier scale consisted of a total of nine sub-factors. These factors

were physical performance, psychological appearance, maintaining health, enhancing life, social interaction, physical exertion, family support, exercise opportunities and spending time. The scale was made up of 43 items in total. The scale had 4 answers from 4 (strongly agree) to 1 (strongly disagree) in the conditioned-choice Likert scale format. The scale had two subgroups: Exercise Barrier Scale and Exercise Benefit Scale. Each subgroup could be used independently. The score range of the benefit scale was between 29-116, and the score range of the barrier scale was between 14-56. The total score of the scale varied between 43-172. The sum of all the items in the scale gave the total score of the Exercise Benefit/Barrier scale. In Ortabağ's study, the Cronbach Alpha value of the scale was calculated as 0.92. The higher the total scale score, the more the individual understood the benefits of exercise.[20]

Fear of Coronavirus (COVID-19) Scale (FCV-19S)

The Turkish reliability and validity study of the scale, which was developed by Ahorsu et al. (2020), was conducted by Bakioğlu, Korkmaz, and Ercan (2020). The scale had a single dimension with 7 items. The total score obtained from all the items of the scale reflected the level of fear of Coronavirus (COVID-19) experienced by the individual. The scores to be obtained from the scale varied between 7 and 35. A high score from the scale meant experiencing a high level of fear of coronavirus.[21,22] In the Turkish adaptation study, the Cronbach-Alpha internal consistency coefficient was found to be 0.88.[22]

Coronavirus Anxiety Scale (CAS)

The Coronavirus Anxiety Scale (CAS), which was developed by Lee et al. (2020), was used as a brief mental health survey to identify possible cases of dysfunctional anxiety associated with the COVID-19 crisis.[23] It was brought into Turkish by Evren and colleagues.[24] CAS was rated for each item on a 5-point scale from 0 (never) to 4 (almost every day) based on experience in the past two weeks. A total CAS score of ≥ 9 indicated coronavirus-related dysfunctional anxiety.[23] In the Turkish adaptation study, the Cronbach-Alpha internal consistency coefficient was found to be 0.80.[24]

Data Collection

Type 2 diabetes individuals were asked to fill the questionnaires online in order to maintain social distance due to the pandemic in the diabetes education center between the specified dates. The questionnaire forms in the study were developed using the google form, and after the patients with type 2 diabetes who applied to the Diabetes education center for any reason were informed about the study, the patients were asked to fill in the questionnaires via WhatsApp or other social communication networks. The patients who were illiterate yet volunteered to participate in the study were directed face-to-face survey questions by the researchers or their relatives and asked to give the closest answer to them. It took an average of 10 minutes to fill out the questionnaire.

Data Analysis

The research data was analyzed using the statistical software program of SPSS 21 (Statistical Package for the Social Sciences). The data was presented as descriptive statistics, percentage and mean ± standard deviation (SD). The relationship between Total Exercise Benefit Perception, which was the dependent variable in the study, and all independent variables in the study was examined using Pearson/Spearmen correlation analysis according to the data type. At the end of the correlation, the independent variables found to have a relationship with the dependent variable were included in the stepwise linear regression model and analyzed. The relationship between the variables in the study was examined with multicollinearity. The statistical significance level of the variables in the study was accepted as $p<0.05$.

Research Ethics

Approval from the ethics committee (Date: 14.07.2021, Meeting 2021/21 and decision 3) was obtained in order to conduct the study. Institutional approval was obtained from the institution where the research data would be collected (Number: 805513, Date: 31.08.2021), and the approval of the Turkish Ministry of Health was taken to conduct the study. Written and verbal informed consent was obtained via an online questionnaire from the patients who met the criteria for inclusion in the study and who agreed to participate in the study.

RESULTS

Socio-demographic characteristics of the individuals with diabetes are given in Table 1. When the socio-demographic characteristics of the individuals with diabetes were examined, it was seen that the mean age was 48.00 (±11.72); that 54.7% were female; that 85.7% were married; that 61.5% had undergraduate or postgraduate degrees; that 55.3% did not have a job; were that 52.8% perceived their income as equal or more than their expenses; and that 89.4% of them lived with one person (table 1).

The characteristics of the individuals with diabetes regarding the disease are given in Table 2. When the characteristics of the disease were examined, it was seen that the mean time for the diagnosis of the patients was 8.72 (±7.62); that 45.3% of them received physical activity and diet or oral antidiabetic treatment; that 65.2% had a chronic disease other than diabetes; that 70.2% received training on exercise/physical activity; that as a person with diabetes, 38.31% of them reported the COVID-19 process to be the biggest barrier to physical activity; that 83.9% of them were careful about the risky situations that should be considered before physical activity; and that 29.52% of them were careful about doing a physical activity or exercise less than one hour after eating. In addition, 91.3 of the diabetic individuals were vaccinated against COVID-19, and they experienced hypoglycemia (54.0%) and psychological problems (48.4%) most in the last six months. Moreover, it was found that A1c mean was 9.49 (±2.92); that total exercise benefit perception mean score was 88.15 (± 15.97); that physical activity self-care behavior mean score was 5.90 (±2.60); that COVID-19 anxiety mean score was 3.21 (±3.77); and that COVID-19 fear mean score was 21.62 (±6.60) (Table 2).

The relationship between the variables associated with the perception of total exercise benefit in individuals with diabetes during the COVID-19 is given in Table 3. The total exercise benefit perception of individuals with diabetes was found to have a positive relationship with COVID-19 anxiety score (r= .259), COVID-19 fear score (r= .185), illiteracy (r=.372), being unemployed (r=.223) , age (r=.277), being married (r=.258), duration of diabetes (r=.190), experiencing hypoglycemia in the last six months (r=.165), diagnosis of retinopathy (r=.187), diagnosis of neuropathy (r=.247), diagnosis of diabetic foot (r=.244), diagnosis of infection (r=.206) and A1c level (r=.206). On the other hand, the total exercise benefit perception of the individuals with diabetes during the COVID-19 was found to have a negative relationship with physical activity self-care behavior (r=-.270), having received education on physical activity (r=-.452) and paying attention to risky situations before exercise (Yes) (r=-.452) (p<.05) (Table 3). In addition, other variables that were not found to have a relationship with the mean score of drug compliance in epilepsy patients were not included due to lack of space in the table. There was no multicollinearity between the variables.

The variables of COVID-19 anxiety, fear of COVID-19, physical activity self-care behavior, illiteracy, employment (unemployed), age, marital status (married), duration of diabetes, taking education on physical activity, paying attention to risky situations before exercise (yes), experiencing hypoglycemia in the last six months (yes), diagnosis of retinopathy in the last six months (yes), diagnosis of neuropathy in the last six months (yes), diagnosis of diabetic foot in the last six months (yes), diagnosis of infection in the last six months (yes) and A1c, which were understood to have a relationship with the total exercise benefit perception of individuals with diabetes during the COVID-19 were included in the stepwise regression model. As a result of the analysis, it was seen that the model established for the total exercise benefit perception of individuals with diabetes was significant (F: 17.873, p < .001). In addition, for the perception of total exercise benefit, paying attention to risky situations before doing physical activity (Yes) (β = -.384), illiteracy status (β =.230), development of diabetic foot in the last six months (Yes) (β = .163), COVID-19 anxiety (β =.205) and marital status (married) (β =.138) were found to be statistically significant predictors (p < .001). It was found that the variables explained 38% of the total variance (Table 4).

DISCUSSION

The results obtained in the study revealed that the mean exercise benefit perception score of individuals with type 2 diabetes during the COVID-19 was higher than the exercise barrier perception score. Moreover, the results of the study revealed that

paying attention to risky situations before doing physical activity, illiteracy, diabetic foot development in the last six months, COVID-19 anxiety and marital status were statistically significant predictors of the perception of total exercise benefit. The aim of this study was to examine the fear of COVID-19, COVID-19 anxiety and descriptive features as predictors of exercise benefit-barrier perception in type 2 diabetes patients during the COVID-19.

In addition, the mean exercise benefit perception score of individuals with type 2 diabetes during the COVID-19 was found to be 60.01 (±11.05), and the mean exercise barrier perception score was 28.13 (± 7.01). When studies conducted before the COVID-19 process were examined, it was seen that the exercise benefit perception scores of individuals with type 2 diabetes were between 86.60 and 90.52, while the exercise barrier perception scores were found to be between 29.83 and 29.83.[25,26] When the mean exercise benefit and barrier perception scores before and during the pre-COVID-19 were compared, it was seen that the exercise benefit perception score in the COVID-19 process decreased significantly (at least 26 points). In the literature, it was reported that the rate of physical activity in individuals with type 2 diabetes increased parallel to the increase in the perception of exercise benefit.[25] During the COVID-19, the rate of physical activity of individuals with diabetes decreased by 10% in one study,[4] and in another study, there was a 2.5-fold decrease.[1] These findings explain the decrease in the exercise benefit perception found in our study. The quarantine practices applied during the COVID-19 might have led to a low perception of exercise benefit in individuals with type 2 diabetes.

The results also demonstrated that the perception of exercise benefit decreased in patients with type 2 diabetes who paid attention to risky situations (precautions for prevention from COVID-19 and precautions for prevention from hypoglycemia or hyperglycemia) before doing physical activity. In a number of studies, it was found that the perceptions of barriers affecting the physical activity of individuals with diabetes were fear of exercise-related symptoms, experiencing hypoglycemia and precautions taken in relation to COVID-19.[5,18,27,28] According to the study investigating the effect of daily physical activity level on night glucose management in individuals with type 1 diabetes

in free living conditions was found that in individuals with type 1 diabetes, continuous use of subcutaneous insulin infusion during physical activity, high level of knowledge about hypoglycemia, reducing insulin infusion before exercise between 30 and 60 minutes, exercising before dinner or taking a snack before unplanned exercise were more frequently associated with hypoglycemia development. In the study, it was pointed out that knowing about physical activity was not protective against hypoglycemia and that it was difficult to avoid hypoglycemia despite various preventive recommendations.[29] In a study examining the experiences of individuals with type 2 diabetes regarding COVID-19 restrictions, one patient reported that s/he had to stay at home for a long time due to quarantine, which became a hobby for him/her and that it was now more difficult to do physical activity to balance his/her blood sugar.[28] In our study, the biggest reason for the decrease in the perception of physical activity benefits as the conditions that diabetic patients should pay attention to during the COVID-19 increased might be the fact that they had to pay attention to the pandemic process and that the quarantine practices resulting from this process made them protect themselves from COVID-19. In addition, another reason could be that they experienced frequent hypoglycemia despite the precautions taken for diabetes management.

As another finding, the perception of exercise benefit increased in illiterate patients with type 2 diabetes during the COVID-19. In a study conducted before the pandemic, it was revealed that education level had no effect on the perception of exercise benefit or barrier in type 2 diabetes patients.[30] However, in studies carried out before the pandemic with patients who received hemodialysis treatment, which was a different research sample, it was reported that the benefit perception of patients with undergraduate or graduate education was statistically higher.[31,32] In a study conducted in the pandemic process, it was found that individuals with diabetes who did not complete their higher education had higher anxiety rates than those who completed their higher education.[13] It is a surprising finding that the research results regarding the exercise benefit/barrier perceptions of patients before the pandemic and their educational backgrounds differed from the results of this study conducted during the pan-

demic period. The difference between these studies could be related to the patients' anxiety caused by the COVID-19 process. In our study, the fact that the perception of physical activity benefit was higher in patients with diabetes with a high anxiety rate supports our interpretation.

It was found that the perception of exercise benefit increased in patients who had developed diabetic foot in the last six months. In the literature, there was no research examining the relationship between the exercise benefit perception of individuals with diabetes during the COVID-19 and the development of diabetic foot. However, it was reported that individuals with diabetes perceived themselves to be more at risk than individuals without diabetes during the COVID-19.[33] In addition, in a meta-analysis study, it was found that the death rate was twice as high in people with diabetes as compared to healthy individuals during the COVID-19 and that people with diabetes had more severe symptoms of COVID-19.[34] According to the study, which aims to create a guide for the use of the model in developing healthy lifestyle behaviors of diabetic patients in line with Pender's Health Promotion Model, it was pointed out that patients with a low perception of barrier and a high perception of seriousness were able to achieve metabolic control and responded better to treatment.[35] In other studies, it was revealed that the rate of physical activity increased as the perception of seriousness about diabetes and diabetes complications increased in individuals with type 2 diabetes.[26,36] In this study, it was thought that the patients with diabetes who had developed diabetic foot in the last six months perceived themselves to be more at risk during the COVID-19; that the perception of seriousness in patients with the development of a complication such as diabetic foot might have increased; and that consequently, the perception of exercise benefit might have increased.

It was revealed that the perception of exercise benefit increased as COVID-19 anxiety increased in patients with type 2 diabetes during the COVID-19. In the literature, there was no research examining the relationship between the exercise benefit perception and anxiety levels of individuals with diabetes during the COVID-19. In one study, it was seen that individuals with diabetes were more concerned about being infected with COVID-19 during the COVID-19 than those without diabetes.[33] In the same

study, it was revealed that individuals with diabetes who did 150 min/week of physical activity per week perceived their health as "very good" during the COVID-19 and that their rate of physical activity increased during the COVID-19.[33] In other studies, it was found that individuals with diabetes who did physical activity during the COVID-19 had lower anxiety rates than those who did not do physical activity.[13,37] According to the study, which aims to create investigate relationships between state anxiety and leisure-domain physical activity levels during COVID-19 pandemic. It was pointed out that physical activity was an important factor in reducing anxiety in healthy individuals while contributing to the treatment of anxious/anxious patients as an anxiolytic.[13] In our study, the reason for the increase in the perception of exercise benefit as the anxiety level of individuals with diabetes increased during the COVID-19 might be the fact that individuals with type 2 diabetes were worried about being infected and that they considered physical activity to be effective in protection from COVID-19. Based on other research results, it could be stated that the low level of anxiety of individuals with type 2 diabetes who did physical activity[13,37] proved this interpretation.

It was found that patients with type 2 diabetes who were married during the COVID-19 had a higher perception of exercise benefit than those who were single. In a study conducted with patients with diabetes before the COVID-19 period, it was similarly revealed that married patients were more motivated/willing to engage in physical activity than single patients.[38] Although it was not statistically significant in studies conducted with individuals with diabetes during the COVID-19 period, physical activity compliance was found to be higher in individuals with diabetes who were married. Although it was not statistically significant in studies conducted with individuals with diabetes during the COVID-19 period, physical activity compliance was found to be higher in individuals with diabetes who were married.[39,40] In a study conducted with healthy individuals, it was found that the moderate rate of physical activity in single individuals during the COVID-19 period decreased when compared to married individuals.[41] It was found that family support of an individual with type 2 diabetes during the COVID-19 increased physical activity treatment compliance.[39] In this study, it was thought that the reason

why married people with diabetes had a higher perception of benefit when compared to single people during the COVID-19 was that the spouses lived in the same house during the COVID-19 quarantine process, and the benefit perception of physical activity increased with the spouse support in married people.

In this study, it was found in the correlation analysis that the perception of exercise benefit increased as the fear of COVID-19 increased, yet this relationship was not found to be significant in the regression model established. In our study, it was found that 91.3% of the individuals with type 2 diabetes had the COVID-19 vaccine. In this study, the reason why fear of COVID-19 was not a significant predictor for the perception of exercise benefit might be related to the fact that almost all of the patients were vaccinated.

CONCLUSION

As a result, it was found that the mean exercise benefit perception score of the individuals with type 2 diabetes during the COVID-19 was higher than the exercise barrier perception score. On the other hand, when compared to the pre-COVID-19 period, it was seen that there was a decrease in the perception of exercise benefit in type 2 diabetes patients. Considering the COVID-19 process, it is recommended that attempts should be made to increase the perception of exercise benefit in the development of physical activity compliance, which is an important treatment method in the management of type 2 diabetes. The reason is that when the perception of benefit from exercise is more than the perception of barriers, it is expected that protective behaviors and physical activity compliance will increase in individuals with diabetes. It was found that fear of COVID-19 was not a statistically significant predictor for the exercise benefit perception of patients with Type 2 diabetes during the COVID-19. In this study, it was also found that the perception of benefit from physical activity decreased as the state of paying attention to risky situations before doing physical activity increased. Additionally, when looking at whether there is a relationship between exercise benefit-barrier perception and socio-demographic characteristics; It was observed that individuals with type 2 diabetes were associated with COVID-19 anxiety, fear of COVID-19, illiteracy, being unemployed and being married.

When examining whether there is a relationship between exercise benefit-barrier perception and patients' disease-related characteristics; It was observed that there was a relationship between duration of diabetes, experiencing hypoglycemia in the last six months, being diagnosed with retinopathy, being diagnosed with neuropathy, developing diabetic foot in the last six months, and A1c level and total exercise benefit perception. Diabetes trainers should be careful about the importance of COVID-19 precautions as well as about the importance of hypoglycemia and hyperglycemia precautions which all should be considered before physical activity in order to increase the perception of exercise benefit, and providing counseling on these issues is recommended. Individuals with type 2 diabetes should be informed about the importance of physical activity in coping with perceived COVID-19 anxiety during the COVID-19. Moreover, in order to increase the exercise benefit perception of individuals with type 2 diabetes, there should be an attempt to improve the perception of seriousness and to provide counseling. In addition, types of exercises that could be done at home during the COVID-19 could be encouraged. Lastly, interventional studies on how to develop positive exercise perceptions of risk groups such as type 2 diabetes in quarantine practices applied during the COVID-19 could be conducted.

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ANNEX

TABLE 1. Socio-demographic characteristics of the diabetic patients

Variable	Number/Percentage (%)/ Mean
Age	48.00±11.72 (min-max=19.00-80.00)
Gender Female Male	88 (54.7) 73 (45.3)
Marital Status Married Single	138 (85.7) 23 (14.3)
Educational Background Illiterate Elementary school Graduate or postgraduate	26 (16.1) 36 (22.4) 99 (61.5)
Employment Employed Unemployed	72 (44.7) 89 (55.3)
Level of Income Income less than expenses Income equal to or higher than expenses	76 (47.2) 85 (52.8)
Living with Whom? Alone Living with a person (Spouse, children, relatives)	17 (10.6) 144 (89.4)

TABLE 2. Characteristics of diabetes patients regarding the disease

Variable	Number/Percentage (%)/ Mean
How long have you had diabetes?	8.72±7.62 (min-max=1-30 years)
Treatment Type Physical Activity and Diet + Oral antidiabetic insulin Oral antidiabetic + Insulin	73 (45.3) 53 (32.9) 35 (21.7)
Do you have any other disease besides diabetes? Yes No	105 (65.2) 56 (34.8)
Have you received training on physical activity / exercise? Yes **No**	113 (70.2) 48 (29.8)
What are the perceived barriers to physical activity as a person with diabetes? [+] a) The COVID 19 pandemic process b) Condemnation/disapproval of an adult's physical activity by the society/environment/neighborhood/family c) Disliking doing physical activity d) Experiencing hypoglycemia too often e) Not being able to do physical activity alone / Not having a companion f) Lacking the habit of doing physical activity g) I can't find time because I'm working at a job	118 (38.31) 40 (12.99) 22 (7.14) 19 (6.17) 38 (12.34) 32 (10.39) 39 (12.66)
Do you pay attention to the following situations before doing physical activity? a) I always measure blood sugar before physical activity, b) …, c) …, d) …, e) … and f) … etc.) Yes No	135 (83.9) 26 (16.1)
Which of the following situations do you pay attention to before doing physical activity? ** **a)** I always measure blood sugar before physical activity **b)** If blood glucose is < 90 mg/dl, I take 15-30 g fast-absorbed carbohydrates/sugar (e.g. fruit, fruit juice, glucose tablet) before exercise, depending on its duration and intensity **c)** If blood glucose is >250 mg/dl and ketone (+), I do not exercise **d)** I exercise at least 1 hour after meals **e)** I drink plenty of fluids before, during and after exercise. **f)** I pay attention to my social distance / wearing a mask due to the COVID-19 pandemic process	16 (7.62) 35 (16.67) 1 (0.48) 62 (29.52) 43 (20.48) 53 (25.24)
Have you had the Coronavirus Vaccine? Yes No	147 (91.3) 14 (8.7)

Have you experienced the following diabetes-related problems in the last 6 months?	Yes	No
Hypoglycemia	87 (54.0)	74 (46.0)
diabetic ketoacidosis	35 (21.7)	126 (78.3)
Retinopathy	53 (32.9)	108 (67.1)
Nephropathy	40 (24.8)	121 (75.2)
Neuropathy	18 (11.2)	143 (88.8)

diabetic foot	22 (13.7) 139 (86.3)
Infection	59 (36.6) 102 (63.4)
Hypertension	43 (26.7) 118 (73.3)
Stroke	2 (1.2) 159 (98.8)
Psychological problems	78 (48.4) 83 (51.6)
Sexual problems	35 (21.7) 126 (78.3)
A1c (%)	9.49±2.92 (min-max=5.40-18.00)
Total Exercise Benefit Perception	88.15±15.97 (min-max=53.00-134.00)
Benefit sub-dimension	60.01±11.05 (min-max=29.00-91.00)
Barrier perception sub-dimension	28.13± 7.01(min-max=14.00-56.00)
COVID 19 Anxiety	3.21±3.77 (min-max=0.00-20.00)
COVID 19 Fear	21.62±6.60 (min-max=10.00-35.00)
Physical activity self-care behavior	5.90±2.60 (min-max=1.50-12.00)

All patients used an insulin pen.

[+] More than one answer was given.

*[*] More than one answer was given.

TABLE 3. The Relationship Between the Total Exercise Benefit Perceptions of Individuals with Diabetes and the Related Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Perception of Total Exercise Benefit	1																
2. CFSTotal	.185*	1															
3. CASTotal	.259**	.623**	1														
4. Physical Activity self-care behavior	-.270**	-.324**	-.289**	1													
5. Illiteracy	.372**	.266**	.186*	-.258**	1												
6. Employment status (Unemployed)	.223**	.300**	.160*	-.287**	.259**	1											
7.Age	.277**	.168*	.122	-.241**	.294**	.308**	1										
8.Marital status (Married)	.258**	.023	.046	-.021	.131	.204**	.111	1									
9. Duration of diabetes	.190*	.158*	.179*	-.286**	.251**	.330**	-.126	.130	1								
10. Taking education on Physical Activity	-.210**	.068	.033	.242**	-.046	-.177*	-.020	-.188*	.035	1							
11 Paying attention to risky situations before	-.452**	-.022	.016	.301**	-.220**	-.191*	-.083	-.083	.048	.378**	1						

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
exercise (Yes).																	
12. Experiencing hypoglycemia in the last six months (Yes)	.165*	.039	.151	-.044	.134	.148	-.216**	.086	.434**	.026	.036	1					
13. Diagnosis of retinopathy in the last six months (Yes)	.187*	.261**	.164*	-.136	.195*	.338**	-.023	.173*	.419**	-.035	.128	.063	1				
14. Diagnosis of neuropathy in the last six months (Yes)	.247**	.125	.163*	-.292**	.273**	.279**	-.059	.145	.410**	-.070	-.005	.090	.506**	1			
15. Diagnosis of diabetic foot in the last six months (Yes)	.244**	.055	.021	-.227**	-.027	.140	-.062	.162*	.343**	-.057	-.071	.040	.260**	.490**	1		
16. Diagnosis of Infection in the last six months (Yes)	.206**	.114	.070	-.088	.052	.140	-.073	.200*	.416**	-.068	.018	.236**	.290**	.426**	.298**	1	
17. A1C	.206**	.275**	.187*	-.255**	.332**	.254**	-.001	.053	.377**	.087	.042	.172*	.363**	.458**	.435**	.247**	1

TABLE 4. Predictors of Total Exercise Benefit Perception in Patients with Diabetes in the COVID-19 Process

Variables	Total Exercise Benefit Perception			
	Beta	SE	T	P
Paying attention to risky situations before doing physical activity (Yes)	-.384	2.767	-6.008	p<.001
illiteracy	.230	2.825	3.522	.001
Development of diabetic foot in the last six months (Yes)	.163	3.041	2.482	.014
COVID-19 Anxiety	.205	.267	3.240	.001
Marital Status (Married)	.138	2.921	2.152	.033
	Model R^2: .410, Adjusted R^2: .388, F:17.873, p<.001			