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RESEARCH ARTICLE

THE INVESTIGATION OF KINESIOPHOBIA, PAIN CATASTROPHIZING, PHYSICAL ACTIVITY, ANXIETY, AND DEPRESSION IN PATIENTS WITH OR WITHOUT MYOCARDIAL INFARCTION

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ABSTRACT

Purpose: The study aimed to investigate kinesiophobia, pain catastrophizing, physical activity, anxiety, and depression in patients with MI.
Material and Methods: A cross-sectional study was conducted with 100 participants (50 myocardial infarction, 50 age-sex matched controls). Participants were evaluated with the Tampa Scale of Kinesiophobia for Heart (TSK Heart), Pain Catastrophizing Scale (PCS), International Physical Activity Questionnaire-Short Form (IPAQ-SF), and Hospital Anxiety and Depression Scale (HAD).
Results: IPAQ-SF (except sitting time) was higher in the control group ($p<0.01$). PCS score ($p<0.01$), HAD-A ($p=0.001$) and HAD-D ($p=0.006$) scores were significantly higher in the MI group. TSK Heart was correlated with Sitting PA ($r=0.425$), Walking PA ($r=-0.574$), Moderate PA ($r=-0.632$), HAD-A ($r=0.641$) and HAD-D ($r=0.827$) ($p<0.01$). There was a relationship between HAD-A with Sitting PA, Walking PA and Moderate PA ($r_1=0.445$, $r_2=-0.485$, $r_3=-0.378$, $p<0.01$). Lastly, HAD-D was correlated with Sitting PA, Walking PA and Moderate PA ($r_1=0.475$, $r_2=-0.520$, $r_3=-0.578$, $p<0.01$).
Conclusion: The study results showed decreased physical activity, increased kinesiophobia, pain catastrophizing, depression and anxiety in patients with MI. In addition, kinesiophobia was related to mild-moderate physical activity and depression-anxiety.

Keywords: Aerobic exercise, fear of movement, MI, pain perception, psychosocial status

INTRODUCTION

Cardiovascular diseases (CVD) cause significant disability and death rates, burdening the health system and economy (1, 2). Various psychosocial parameters also additionally have a negative impact on public health. Myocardial infarction (MI) patients

Table 1. The baseline physical and clinical characteristics of the participants

	MI patients (n=50)	Control group (n=50)	p
Age (years, mean±SD)	61.9±11.9	62.5±10.2	0.514[a]
Gender (women/men, n)	11/39	13/37	0.640[b]
BMI (kg/m^2, mean±SD)	25.8±2.1	26.6±3.0	0.393[a]
Duration after MI (months, mean±SD)	4.9±3.8	n/a	n/a
Type of MI (STEMI/Non-STEMI, n)	25/25	n/a	n/a
Marital status (married/single, n)	47/3	44/6	0.295[b]
Occupation status (active/retired, n)	16/32	23/27	0.159[b]

SD: standard deviation, n: number of patients, BMI: Body Mass Index, MI: Myocardial Infarction, STEMI: ST-Elevation Myocardial Infarction, Non-STEMI: Non-ST-Elevation Myocardial Infarction, a: Mann–Whitney U test, b: Pearson Chi Square test

are prone to fear movement. Kinesiophobia indirectly leads to a sedentary lifestyle in MI patients. Accordingly, the symptoms of individuals with MI should be addressed comprehensively, including the psychological state (3, 4).

Previous studies reported that the risk of MI for depressed individuals is 2.9 times (5), and the risk of MI for individuals with anxiety is 2.5 times (6). Moreover, anxiety and depression are independent risk factors that increase cardiac morbidity and mortality (7). Fear and avoidance behavior develop in the acute period in individuals with MI. There is a possibility of developing kinesiophobia, in individuals who cannot control their fear (8). Increased anxiety in individuals with coronary artery diseases (CAD) affected kinesiophobia behaviours (9).

Studies have revealed that 21% of individuals develop kinesiophobia six months following the cardiac event (10). Physical inactivity and depression develop due to kinesiophobia and destructive thoughts, leading to avoidance behavior (11, 12). Individuals with CAD have been shown to avoid physical activity and exercise due to fear of movement (13, 14). In addition, activity areas such as fitness centers were suspended in many countries during the COVID-19 pandemic. Long-term quarantine practices have created a deficiency in staying physically active and affect people's quality of life (15). As a vicious circle, insufficient physical activity again causes negativities such as kinesiophobia and catastrophic thoughts. The importance of physical activity in the rehabilitation of MI patients is an undeniable fact (16).

The fact that there are studies for patients with acute MI, kinesiophobia levels of MI patients has not been demonstrated by cross-sectional studies, holistically (10, 14). Revealing kinesiophobia would be an essential contribution to the rehabilitation process of coronary artery disease. Crucial negative clinical variables caused by kinesiophobia on prognosis can be prevented. To our knowledge, no studies have focused on patients' perceptions of kinesiophobia after MI, holistically. The study aimed to investigate kinesiophobia, pain catastrophizing, physical activity, anxiety, and depression in patients with MI. Accordingly, the difference between the parameters of pain catastrophizing, physical activity, anxiety, and depression in individuals with and without MI was compared. The study questioned whether pain catastrophizing, physical activity, anxiety, and depression increase in patients with MI. We hypothesized that pain catastrophizing, physical activity, anxiety, and depression might be increased in patients with MI compared to healthy individuals. The secondary aim was to analyze the correlation degree between kinesiophobia, pain catastrophizing,

Table 2. The comparison of the scores between the groups

	MI patients (n=50)	Control group (n=50)	p
IPAQ - Total (MET min week−1)	598.9±383.4	5115.3±5870.4	**0.001[a]**
Sitting PA (MET min week−1)	355.6±429.4	381.5±369.4	0.498[a]
Walking PA (MET min week−1)	104.9±131.4	2031.3±2569.6	**0.001[a]**
Moderate PA (MET min week−1)	58.4±119.3	716.3±1554.5	**0.009[a]**
Vigorous PA (MET min week−1)	0.0±0.0	554.0±1665.0	**0.001[a]**
PCS	26.0±9.4	7.3±8.5	**0.001[a]**
HAD-A	9.0±2.7	4.7±3.0	**0.001[a]**
HAD-D	8.2±3.8	6.0±3.1	**0.006[a]**
TSK Heart	44.2±5.6	n/a	n/a

SD: standard deviation, n: number of patients, IPAQ: International Physical Activity Questionnaire-Short Form, PA: Physical activity, MET: Metabolic equivalent, PCS: Pain Catastrophizing Scale, HAD-A: Hospital Anxiety and Depression Scale-Anxiety Subscale, HAD-D: Hospital Anxiety and Depression Scale-Depression Subscale, TSK Heart: Tampa Scale for Kinesiophobia Heart, a: Mann–Whitney U test

physical activity, anxiety, and depression in individuals with MI.

MATERIAL AND METHODS

Study Design and Participants

A cross-sectional study was conducted between January and June 2022 with a total of 100 participants, 50 of whom were diagnosed with myocardial infarction by a cardiologist, and 50 were age and sex-matched control group without a history of myocardial infarction, in the Department of Cardiology at Muğla Sıtkı Koçman University. Inclusion criteria for the study; patients over 18 years of age, at least one month and maximum of one year after myocardial infarction, and who could speak Turkish were determined. The potential cases of MI and the control group with orthopaedic/neurologic diseases, severe psychiatric, somatic and pulmonary disorders, presence of comorbidities such as heart valve disease, cardiac shock and cardiomyopathy, patients with heart failure and physical activity limitation who scored three or worse according to the New York Heart Association Functional Classification (17), and individuals who did not sign the consent form were excluded from the study.

Procedure

The study was conducted following ethical principles and the Declaration of Helsinki. Participants were included in the study through a questionnaire-based assessment. Expert two cardiologists assessed the participants with a diagnosis of myocardial infarction. Informed voluntary consent was obtained from the participants before participating in the study. The study protocol was approved Ege University, Medical Research Ethics Committee (No:21-4.1T/63, Date: 15.04.2021).

Data Collection

Demographic and clinical characteristics (e.g., type of myocardial infarction, time elapsed after myocardial infarction) of all participants included in the study were recorded. All participants were evaluated with the Tampa Scale of Kinesiophobia for Heart (TSK Heart), International Physical Activity Questionnaire-Short Form (IPAQ-SF), Hospital Anxiety and Depression Scale (HAD), Hospital Anxiety and Depression Scale-Anxiety Subscore (HAD-D), The Pain Catastrophizing Scale (PCS).

Table 3. The relationship of kinesiophobia with other symptoms

n: 50	TSK Heart (r)	p
IPAQ - Total	0.112	0.438
Sitting PA	**0.425****	0.002
Walking PA	**-0574****	0.0001
Moderate PA	**-0.632****	0.0001
PCS	0.047	0.746
HAD-A	**0.641****	0.0001
HAD-D	**0.827****	0.0001

SD: standard deviation, n: number of patients, IPAQ: International Physical Activity Questionnaire-Short Form, PA: Physical activity, PCS: Pain Catastrophizing Scale, HAD-A: Hospital Anxiety and Depression Scale-Anxiety Subscale, HAD-D: Hospital Anxiety and Depression Scale-Depression Subscale, TSK Heart: Tampa Scale for Kinesiophobia Heart, r: Spearman correlation coefficient, **: p<0.001

Sample Size

The G-Power 3 software was used to conduct the research's power analysis (18). Even though no comparable studies were published, "Cohen's d" was utilized to calculate the "effect size". Considering the “medium effect size” (0.50) (19), 46 cases were anticipated to be adequate for MI and control groups (80% power and 95% confidence level were considered).

Tampa Scale of Kinesiophobia for Heart (TSK Heart)

The Tampa Kinesiophobia Scale (TSK) was developed by Kori et al. (20). TSK was adapted to cardiac diseases by Bäck et al. and named (TSK-H). The TSK-H was adapted in Turkish by Acar et al. TSK-H consists of 7 items and four sub-dimensions, and each item scores between 1 and 4 points. After reversing the 4th, 8th, 11th and 12th items, the total score is calculated. The scores obtained from the scale are in the range of 17-68 points. A high score on the scale indicates high kinesiophobia (21).

International Physical Activity Questionnaire-Short Form (IPAQ-S*)*

IPAQ-S was adapted in Turkish by Saglam et al. (22). The questionnaire, consisting of 7 questions, questions the frequency and duration of light, moderate and vigorous physical activities performed in the last seven days. According to the total score calculated, individuals' physical activity levels are classified as inactive, low, or adequate (23).

Hospital Anxiety and Depression Scale (HAD)

HAD was developed by Zigmond and Snaith (24). HAD was adapted in Turkish by Aydemir et al. The scale includes anxiety and depression sub-dimensions. The HAD scale contains 14 questions, half of which (odd numbers) measure anxiety and the other half (even numbers) depression. Questions in the scale are scored on a four-point Likert scale, each ranging from 0 to 3. A higher score indicates a worse condition (25).

The Pain Catastrophizing Scale (PCS)

PCS consists of 13 questions with a Likert-type scale scored between 0-4. A high score indicates an increased pain and fear of experiencing pain (27). PCS was developed by Sullivan et al. (26). PCS was adapted in Turkish by Suren et al.

Statistical Analysis

“SPSS software (Statistical Package for Social Sciences) was used for Windows v25.0 (SPSS Inc, IBM Corp, Armonk, New York). The variables were provided as mean, standard deviation (SD), and per cent). A statistical significance level of 0.05 was chosen. The normality of the variables was demonstrated using the one-sample Kolmogorov–Smirnov test and a Histogram. Because none of the data distributions was normal, the Mann-Whitney U test was used to compare case group differences. The discrepancies between the categorical variables were further checked using Pearson's chi-square test. The comparison of the parameters was also carried out with the Spearman correlation coefficient.”

RESULTS

The mean age of the MI group and control group were 61.9±11.9 years and 62.5±10.2 years, respectively. The STEMI and non-STEMI type of MI were equal (n:25/25). The mean duration after MI was 4.9±3.8

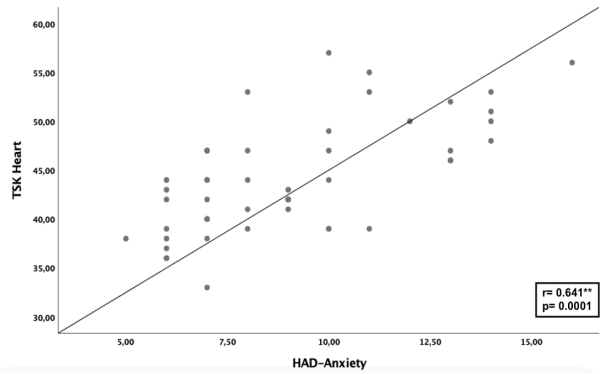

Figure 1. Scatter plot of the correlation between TSK Heart and HAD-Anxiety

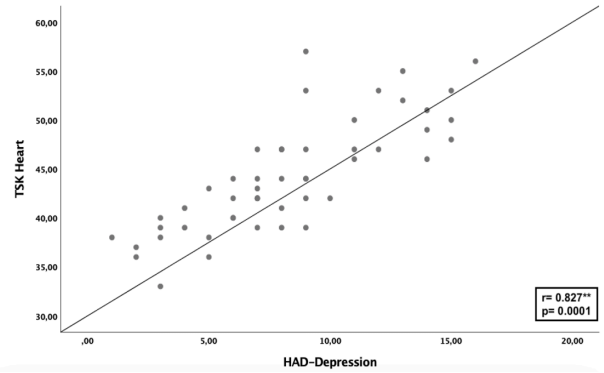

Figure 2. Scatter plot of the correlation between TSK Heart and HAD-Depression

months. The baseline physical, demographical and clinical characteristics of the two groups are presented in Table 1. There was no significant difference in the baseline data of the groups (p>0.05). The questionnaire-based assessment results from the comparison of the MI and control group patients are given in Table 2. There was a significant difference between the two groups in IPAQ - Total (MET min week−1), Walking PA (MET min week−1), Moderate PA (MET min week−1), and Vigorous PA (MET min week−1) (p<0.01). The control group were significantly more physically active. However, Sitting PA (MET min week−1) was not statically different between groups (p>0.05).

PCS score was higher in MI patients (p<0.01). On the other hand, HAD-A (p=0.001) and HAD-D (p=0.006) scores were significantly higher in the MI group. Since TSK Heart was developed to assess cardiac patients, the sex and age-matched control group could not fill out this questionnaire. Therefore, a comparison of the groups was unavailable for the TSK Hearth.

Correlational analysis was carried out to holistically observe the relationship between parameters in the MI group. First, PCS was not significantly correlated with any parameters (p>0.05). Second, TSK Heart was correlated with Sitting PA (r=0.425), Walking PA (r=-0.574), Moderate PA (r=-0.632), HAD-A (r=0.641) and HAD-D (r=0.827) (p<0.01) (Table 3) (Figure 1 and 2). Third, there was a relationship between HAD-A with Sitting PA, Walking PA and Moderate PA (r_1=0.445, r_2=-0.485, r_3=-0.378, p<0.01). Lastly, HAD-D was correlated with Sitting PA, Walking PA and Moderate PA (r_1=0.475, r_2=-0.520, r_3=-0.578, p<0.01) (Table 4).

DISCUSSION

The present study results revealed physical inactivity, increased kinesiophobia, pain catastrophizing, depression and anxiety in patients with or without myocardial infarction. Besides, kinesiophobia was demonstrated to be related to mild to moderate physical activity and depression-anxiety. On the other hand, depression and anxiety symptoms of the MI patients were also correlated with walking and moderate physical activities.

During to COVID-19 era, individuals were prone to stay at home for a long time without daily routines. Therefore, people's physical activity decreased daily (28). Individuals with MI have been more affected by quarantine measures as they are in the risk group due to their chronic diseases (29). Along with the decreased level of physical activity, there were also negative effects on the psychological state of individuals with MI (30). In this respect, neuropsychiatric parameters such as kinesiophobia and pain catastrophizing may be indirectly affected. The present study is unique in terms of the relevant psychosocial parameters. Furthermore, kinesiophobia in MI patients had not been adequately investigated. Various studies investigated kinesiophobia with cases of coronary artery disease (10, 13, 14, 31-34). However, to our knowledge, no other studies demonstrated kinesiophobia and pain catastrophizing specific to MI cases, and a comparative analysis was not conducted.

Only one qualitative study has performed an analysis based on the relationship of kinesiophobia to physical activity and exercise (35). The relationship between these two parameters, the cornerstones of cardiac rehabilitation, with fear of movement was investigated in patients who left 2-3 months after acute MI. The study's results emphasized that coping with the fear

Table 4. The relationship of depression-anxiety with other symptoms

n: 50	HAD-A (r / p)	HAD-D (r / p)
IPAQ - Total	0.254 / 0.075	0.200 / 0.163
Sitting PA	**0.445**** / 0.001	**0.475**** / 0.0001
Walking PA	**-0.485**** / 0.0001	**-0.520**** / 0.0001
Moderate PA	**-0.378**** / 0.007	**-0.578**** / 0.0001
PCS	0.272 / 0.056	0.050 / 0.732

SD: standard deviation, n: number of patients, IPAQ: International Physical Activity Questionnaire-Short Form, PA: Physical activity, PCS: Pain Catastrophizing Scale, HAD-A: Hospital Anxiety and Depression Scale-Anxiety Subscale, HAD-D: Hospital Anxiety and Depression Scale-Depression Subscale, r: Spearman correlation coefficient, **: p<0.001

of movement after myocardial infarction is a dynamic process that requires internal and external support. However, since there is no quantitative data, the relational analysis should have been emphasized at the statistical significance level and based on numerical data. The results of our study made an additional contribution to the literature in this respect. Since it is known that MI patients with high anxiety and depression have more pain perception (36), our study is valuable in terms of catastrophizing pain and associating it with kinesiophobia. In addition, the long-term depression-reducing effect of physical activity also indirectly affects kinesiophobia and pain catastrophe through psychosocial parameters (37).

The present research was a cross-sectional case-control study. The individuals with MI who left the first one-month acute period was compared with the age- and sex-matched control group. We also showed that some physical and demographic data were congruent in baseline assessment between the two groups. In this respect, it was observed that the selectivity of the study's exclusion criteria was well-accomplished. That is, the two groups were homogeneous in terms of socio-demographic data. Since the BMI, marital and occupational status of the patients were considered to affect their psychological and physical status, the groups' homogeneity had the utmost importance in controlling the analysis.

Our study mentioned that individuals with MI were more inactive in all physical activity parameters (except sitting time). It was also observed that individuals with MI had worse clinical conditions regarding pain catastrophe and anxiety depression. Kinesiophobia was associated with sitting and moderate physical activity levels. In other words, individuals who are active in walking and moderate physical activities have less fear of movement. As expected, it was concluded that individuals with low depression and anxiety levels also had low kinesiophobia. In addition, it has been revealed that those who do more walking and moderate-intensity activities have better psychosocial status.

It was already known that the psychosocial states of physically active individuals were better in patients with MI (30, 36). It is apprehended that aerobic exercises such as light-paced walking and moderate-intensity recreational activities, which are included in many cardiac rehabilitation programs and guidelines, are essential in reducing anxiety and depression symptoms (38). In parallel, we observed that kinesiophobia was low in these individuals. Individuals are more able to overcome their fear of movement with an active life. However, pain catastrophizing was not associated with any parameter. In other words, it is not possible to say that individuals who are physically active, have a low level of depression and do not have kinesiophobia are at a reasonable level in terms of pain catastrophizing. The relationship between the perception of pain and the psychological state is already distinguished (36). Though, we concluded that individuals maintain their pain perceptions independently of their movement and physical activity levels in the post-MI period. Considering the quantitative and qualitative studies that recommend following the fear of movement as a process (10), a more comprehensive study in pain catastrophizing, especially in patients who have passed one year after MI is recommended. Moreover, the positive effect of one-year physical activity and follow-up on psychiatric condition supports this situation (39).

Kinesiophobia and psychosocial status in coronary artery disease have been discussed in various studies in the literature (10, 13, 14, 31-34). Bäck et al. found kinesiophobia associated with physical activity level (moderate-high) and anxiety (13). Şahin et al. also emphasized the relationship betwleeen aerobic capacity, physical activity and kinesiophobia and claimed that cardiac rehabilitation reduces fear of movement (34). Knapik et al. suggested that kinesiophobia can be reduced by increasing physical

activity (31). These results also supported our results regarding physical activity and psychosocial level. On the other hand, several studies associated kinesiophobia with age, gender and education level in individuals with MI (10, 31, 40). Since we have strictly controlled our exclusion criteria, both groups were age, sex and other demographics matched. Therefore, the differences in age, gender or education would not affect the results of our study, presumably. According to another research report, it is also reported that individuals with kinesiophobia stay away from entering a cardiac rehabilitation program (14). Most cardiac rehabilitation program includes aerobic moderate physical activity pieces of advice (38). Therefore, also considering the results of our study, physical activity and kinesiophobia are thought to be entered a vicious circle in patients with MI. Yümin et al. emphasized that kinesiophobia reduces the quality of life in individuals with coronary artery disease (33). Since it is known that people with low physical activity have high levels of anxiety and depression, it can be predicted that the psychological dimension of quality of life may also be low in individuals with kinesiophobia.

Some limitations of the study should be emphasized. First, individuals could be evaluated in different periods from the beginning of the pandemic, and the results could be presented. In this way, the effect of psychological state and decrease in physical activity on kinesiophobia and pain catastrophizing could be observed more clearly. Second, a more comprehensive activity assessment would be possible if physical activity assessment was evaluated with sensor-based wearable health technologies such as a pedometer or an accelerometer. Third, analyzes could be replicated according to the education level and gender of the patients.

CONCLUSION

The study results showed decreased physical activity, increased kinesiophobia, pain catastrophizing, depression and anxiety in patients with MI. In addition, kinesiophobia was related to mild to moderate physical activity and depression-anxiety. Also, depression and anxiety symptoms of the MI patients were observed to be related to walking and moderate physical activities. Considering the relationship of kinesiophobia with mild to moderate physical activity, clinicians may have taken precautions against kinesiophobia by encouraging individuals with MI to engage in physical activity. Further studies should detail the relationship between physical activity and kinesiophobia in more comprehensive physical activity monitoring from MI patients with a pedometer or sensor-based devices.

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Conflict of interests: The authors declare that they have nocompeting interests.

Ethical approval: The study was carried out in accordance with the ethical principles and the Helsinki Declaration. The study protocol was approved by the Medical Ethics Committee of Ege University (No:21-4.1T/63, Date: 15.04.2021). Informed consent of the patients was obtained.

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