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Safety and efficacy of motor imagery-based physical activity in high-risk pregnancy: A randomized controlled study

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Abstract

Objective: This study aimed to investigate the acute effects of motor imagery-based physical activity on maternal well-being, maternal blood pressure, heart rate, oxygen saturation, fetal heart rate, and uterine contractions in women with high-risk pregnancies.

Methods: This randomized controlled trial was conducted in Izmir Tepecik Education and Research Hospital from August 2023 to January 2024. Seventy-six women with high-risk pregnancies were randomized into two groups: a motor imagery group ($n=38$, diaphragmatic-breathing exercise and motor imagery-based physical activity) and a control group ($n=38$, diaphragmatic-breathing exercise). Maternal well-being was determined using the Numerical Rating Scale-11. Digital sphygmomanometry was used to measure maternal heart rate and blood pressure, pulse oximetry for oxygen saturation, and cardiotocography for fetal heart rate and uterine contractions. Assessments were performed pre-intervention, mid-intervention, and post-intervention.

Results: There were no significant differences in baseline characteristics between groups ($P>0.05$). There was a significant main effect of time in terms of maternal well-being and maternal heart rate ($P=0.001$ and $P=0.015$). In addition, there was a significant main effect of the group on oxygen saturation ($P=0.025$). The overall group-by-time interaction was significant for maternal well-beingm with an effect size of 0.05 ($P=0.041$).

Conclusion: The combination of diaphragmatic-breathing exercises and a motor imagery-based physical activity program in women with high-risk pregnancies was determined to have no adverse effects on the fetus, did not induce uterine contractions, and resulted in a significant improvement in maternal well-being and oxygen saturation. Thus, imagery-based physical activity can be used in high-risk pregnancies where physical activity and exercise are not recommended.

KEYWORDS

blood pressure, exercise, fetal, high-risk pregnancy, motor imagery, vital signs, well-being

Brief Synopsis: Diaphragmatic breathing exercises and a motor imagery-based physical activity program result in a significant improvement in maternal well-being and oxygen saturation without inducing uterine contractions.

Registration: This study has been registered in ClinicalTrials.gov with registration number NCT05946252.

1 | INTRODUCTION

Antepartum bed rest or activity restriction is frequently recommended to prevent adverse outcomes associated with complications of high-risk pregnancies.[1] Despite the high recommendation rate for bed rest for high-risk pregnancies, the evidence on the efficacy of bed rest for improving maternal and fetal outcomes is conflicting.[2,3] Common complaints in pregnancy, such as dyspepsia, constipation, swelling in the lower limbs, and back pain, might intensify due to physical inactivity.[4] Moreover, in pregnant women on bed rest, muscle mass decreases and protein breakdown increases between the third and seventh days, along with an extended period required for muscle reoxygenation after exercise.[5]

A meta-analysis Tsironikos et al. (2022) reported that specific exercises could be added to the standard antenatal care procedure for high-risk pregnancies.[6] However, the presence of preexisting pregnancy-related complications, coupled with anxiety, provides obstacles to engaging in physical activity with high-risk pregnancies. Variations in the perception of physical activity could exist between pregnant women at high risk and those with healthy pregnancies, and various factors might influence variations in perception and attitude towards exercise and physical activity within this cohort.[7–9] Considering these variations, motor imagery-based activities, which refer to the mental process of envisioning a movement without physically executing it, can be used in women with high-risk pregnancies.[10]

Mokaberian et al. (2021) reported that women with high-risk pregnancies who engage in imagery-based yoga and relaxation exercises experience a significant increase in uteroplacental and fetoplacental blood flow, potentially enhancing intrauterine fetal growth.[11] In addition, the inclusion of both healthy individuals and those with gestational hypertension in motor imagery-based progressive relaxation exercises has been found to lead to improvements in maternal anxiety, stress, and fetal attachment, as well as a reduction in maternal systolic and diastolic blood pressure.[11–13] Further research in motor imagery-based activities could help clinicians who work with women with high-risk pregnancies guide managing bed rest and decreasing its adverse effects on either the fetus or the mother. Therefore, the present study aimed to investigate the acute effects of motor imagery-based physical activity on maternal well-being, maternal heart rate, blood pressure, and oxygen saturation, as well as fetal heart rate and uterine contractions in women with high-risk pregnancies.

2 | MATERIALS AND METHODS

This prospective study is designed as a randomized controlled trial. The sample size and power calculation were performed using the G*Power 3.1.9.2 power analysis program. "GPower F-test: Repeated Measures, Within Factors" was used. The calculations were based on an effect size of 0.25 points (medium effect size),[14] an alpha level of 0.05, a number of groups of 2, a number of measurements of 3, and the desired power of 95%. These parameters generate a necessary sample size of at least 44 patients in total. A total of 76 volunteer patients were included in the study.

Seventy-six women with high-risk pregnancies were admitted to the Department of Obstetrics and Gynecology, Health Sciences University Izmir Tepecik Education and Research Hospital, from 8 January, 2023 to 1 May, 2024. Ethical approval for this study was obtained from the Health Sciences Research Ethics Committee of Izmir University of Economics (Approval Number: B.30.2.İEÜSB.0.05.05.-20-193, No: 56). Patients were informed about the study and signed a written consent form that complied with the Declaration of Helsinki. This trial was registered to ClinicalTrials.gov (Identifier: NCT05946252).

Women with high-risk pregnancies who had completed the 12th week of pregnancy and received inpatient care were included. Bed rest and physical activity restrictions were recommended due to a body mass index of 30 or higher, the risk of cervical insufficiency, multiple pregnancies, uncontrolled gestational diabetes, fluctuating blood pressure, and recurrent urinary tract infections. The exclusion criteria were as follows: any severe cardiovascular, pulmonary, and systemic disorders; a history of psychological seizure disorders; any mental problems hindering cooperation and understanding; any medical condition preventing the safe and effective implementation of interventions; and other high-risk groups with the potential for early intervention for obstetric outcomes (e.g. early membrane rupture, placenta previa, and pre-eclampsia).

Among 86 patients who presented to the inpatient clinic, 76 patients were determined to meet the inclusion and exclusion criteria (Figure 1). Two separate sets of numbers, each comprising 38 numbers, were created using the "Research Randomizer" website. Numbers randomly selected by the program were placed in individual envelopes so that each envelope contained one number. After determining eligibility based on inclusion criteria, each participant was asked to choose an envelope. Participants were then allocated to groups (a motor imagery group and a control group) based on the number inside the chosen envelope, resulting in a total of 76 participants. Randomization was conducted by a blind researcher without clinical involvement. Participants were blinded to group allocation and the examiner who assessed the outcomes was blinded to group assignment.

Participants were randomized into two groups: the motor ımagery group ($n=38$), which received diaphragmatic breathing exercises and motor imagery-based physical activity, and the control group ($n=38$), which received diaphragmatic breathing exercises. Both groups attended a single session of therapy. The motor ımagery group received diaphragmatic breathing exercises for 5 min and motor imagery-based physical activity for 15 min. The control group received diaphragmatic breathing exercises for 5 min and then rested for 15 min.

2.1 | Diaphragmatic breathing exercise

Patients were instructed to rest for 5 min in the supine position, lying on their backs on a flat surface with pillows under their heads and knees for support. Then, patients followed the following instructions: "Close your eyes; place one hand on your chest and the other on your abdomen. Take a deep breath through your nose, directing

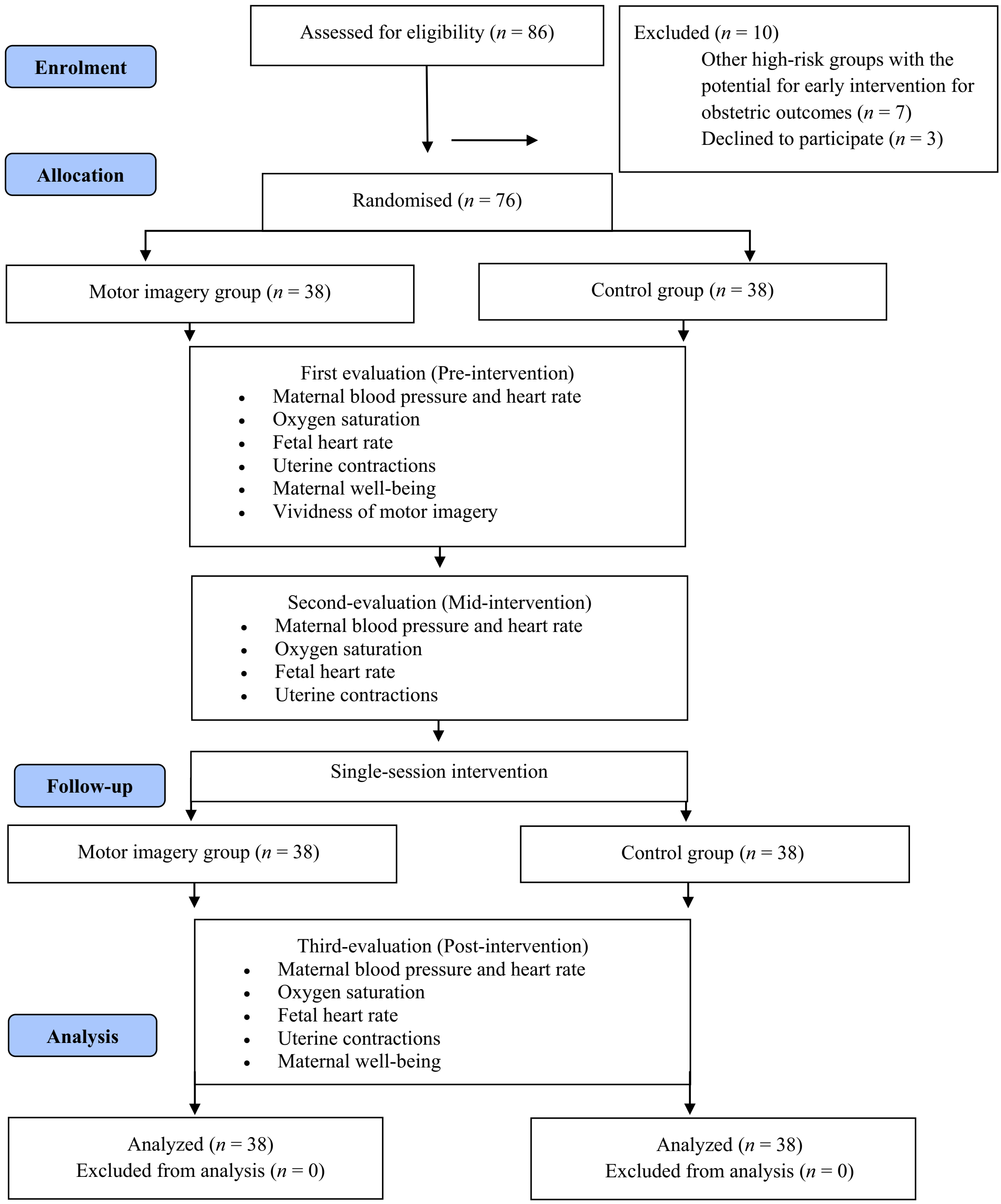

FIGURE 1 Design of the study (CONSORT flow diagram).

all the air as much as possible down towards the hand on your abdomen. Imagine that you are inflating a balloon in the lower rib and abdominal region. Try to keep the hand on your chest as still as possible. Now, slowly exhale all the air from your mouth." Diaphragmatic breathing exercises were performed for 5 min.[15]

2.2 | Motor imagery-based physical activity

The introduction of the session included information on what motor imagery is, its purpose, what is expected from the patients during the intervention, the need to focus on kinesthetic senses during imagery, and the importance of performing imagery purely mentally without any physical muscle movement. Detailed instructions were provided on how to perform imagery from both the first-person and third-person perspectives.

The exercise recommendations for pregnancy provided by the American College of Obstetricians and Gynecologists and the Canadian Guidelines for Physical Activity during Pregnancy were used for the motor imagery scenario,[16,17] and the PETTLEP (physical, environment, task, timing, learning, emotion, perspective) model was followed in the motor imagery training.[18]

TABLE 1 Baseline characteristics of patients with high-risk pregnancy in both groups.

Characteristics	Motor imagery group ($n=38$)	Control group ($n=38$)	*P*-value[a]
Age (year), mean (SD)	28.84 ± 5.49	27.24 ± 5.68	0.213
Body mass index (kg/m^2), mean (SD)	31.05 ± 7.60	30.04 ± 5.40	0.547
Education, number (%)			
Primary school	22 (57.89)	23 (60.52)	0.691[b]
High school	12 (31.57)	13 (34.21)	
Undergraduate	4 (10.52)	2 (5.26)	
Gestational age (week), mean (SD)	31.68 ± 3.63	32.66 ± 3.74	0.254
Gravidity, number (%)			
Yes	12 (31.57)	12 (31.57)	1.00[b]
No	26 (68.42)	26 (68.42)	
Number of gravidity, mean (SD)	1.71 ± 1.67	1.76 ± 1.68	0.898
Parity, number (%)			
Yes	17 (44.73)	17 (44.73)	0.898[b]
No	21 (55.26)	21 (55.26)	
Miscarriage, number (%)			
Yes	29 (76.31)	24 (63.15)	0.332[b]
No	9 (23.68)	13 (34.21)	
Abortion, number (%)			
Yes	27 (71.05)	31 (81.57)	0.285[b]
No	11 (28.94)	7 (18.42)	
Gynecologic surgery, number (%)			
Yes	12 (31.57)	7 (18.42)	0.183[b]
No	26 (68.42)	31 (81.57)	
Doing exercise before pregnancy, number (%)			
Yes	9 (23.68)	6 (15.78)	0.388[b]
No	29 (76.31)	32 (84.21)	
Types of high risk pregnancy, number (%)			
Body mass index ≥ =30 kg/cm^2	3 (7.89)	2 (5.26)	0.542[b]
Cervical insufficiency	7 (18.42)	9 (23.68)	
Multiple pregnancies	10 (26.31)	11 (28.89)	
Uncontrolled gestational diabetes	9 (23.68)	7 (18.42)	
Fluctuating blood pressure	2 (5.26)	3 (7.89)	
Recurrent urinary tract infections	7 (18.42)	6 (15.78)	
Maternal well-being (score), mean (SD)	5.61 ± 2.81	6.68 ± 2.06	0.169
Systolic blood pressure (mmHg), mean (SD)	109.58 ± 15.98	107.37 ± 16.24	0.553
Diastolic blood pressure (mmHg), mean (SD)	65.53 ± 11.19	65.87 ± 14.88	0.915
Maternal heart rate (bpm), mean (SD)	87.26 ± 10.68	88.87 ± 11.14	0.521
Oxygen saturation (%), mean (SD)	94.76 ± 4.77	96.24 ± 1.88	0.816
Fetal heart rate (bpm), mean (SD)	142.92 ± 11.21	141.37 ± 11.89	0.563
Uterine contraction (MVUs), mean (SD)	19.13 ± 6.64	20.58 ± 10.30	0.464
VMIQ-2 (score), mean (SD)			
External visual imagery	32.18 ± 13.74	33.02 ± 16.84	0.814
Internal visual imagery	27.42 ± 11.92	30.82 ± 15.51	0.286
Kinesthetic imagery	34.55 ± 12.75	36.41 ± 14.73	0.552

Abbreviations: BPM, beats per minutes; MVUs, Montevideo units; SD, standard deviation; VMIQ-2, Vividness of Movement Imagery Questionnaire-2.

[a]Independent samples *t*-test; significance was accepted as $P < 0.05$.

[b]χ^2-test, significance was accepted as $P < 0.05$.

A motor imagery-based physical activity program was individually administered to patients in the most comfortable position in the bed. The patients were instructed to keep their eyes closed, and the room was closed off from outside distractions, creating a calm setting. To promote relaxation, individuals were instructed to focus on their breathing, developing an awareness of each specific body region and relaxing the muscles in those particular places. The motor imagery-based physical activity program was conducted for 15 min with an imagery scenario. The imagery scenario included the following exercises:

1. Imagine a pregnant woman relaxing with slow deep breathing, sequentially imagining slow walking, brisk walking, and running activities by the seaside.
2. Take a rest break and imagine a relaxation activity by sitting on a bench and observing the surroundings (as if sitting next to another pregnant woman).
3. Imagine upper extremity strengthening exercises with dumbbells in the sitting position: (a) shoulder flexion, (b) shoulder abduction, (c) horizontal adduction, and (d) elbow flexion and lower extremity strengthening exercises with resistance bands. Imagine upper extremity strengthening exercises with dumbbells in the sitting position in the supine position: (a) knee–hip flexion, (b) knee extension, (c) hip abduction, (d) hip adduction, and (e) ankle dorsiflexion/plantar flexion, along with body-specific exercises such as bridging, posterior pelvic tilt, and tabletop stabilization.
4. Take a rest break and imagine a relaxation activity by sitting on a bench and observing the surroundings (feeling the wind and sunlight on the face).
5. Conclude the imagery with returning home and indoor activities. Indoor activities are diversified, imagining actions such as bending down, lifting a laundry basket, squatting to pick up an object from the floor, and loading the dishwasher. Finally, patients are asked to feel the satisfaction of having exercised while lying on a comfortable couch.

The primary outcome measure for the present study was maternal well-being, which was assessed using the Numerical Rating Scale-11 (NRS-11). The secondary outcome measures were blood pressure and heart rate, oxygen saturation, fetal heart rate, and uterine contractions. Assessment of the primary outcome measure was performed pre-intervention (at baseline) and post-intervention (after 15 min), and secondary outcome measures were performed pre-intervention (at baseline), mid-intervention (at 7th min), and post-intervention (after 15 min). The vividness of motor imagery was not used as an outcome measure, but it was evaluated at baseline to confirm that both groups had a similar vividness of motor imagery.[19]

Maternal well-being was assessed using the NRS-11 (ranging from 0 to 10).[20] On a scale of 0 (no positive effect) to 10 (very positive effect), pregnant women rated the level of well-being that the intervention had created.

A digital sphygmomanometer was used for the measurement of maternal blood pressure and heart rate.[21] Measurements were taken from the left arm of all patients, and systolic and diastolic blood pressures were recorded in mmHg.

Oxygen saturation was measured using a pulse oximeter placed on the right index finger of each patient. After attaching the oximeter sensor to the index finger, patients were instructed to wait until a reading appeared on the oximeter display. Additionally, patients were asked to wait for an additional 15 seconds to ensure a steady signal.[22] The pulse oximeter remained on the patient's finger throughout the intervention.

A cardiotocography (Philips Avalon FM20 Fetal Monitor) was used to monitor the fetal heart rate and uterine contractions. The Doppler probe detecting fetal heart rate and the tocometer probe detecting uterine contractions were attached to the abdomens of the patients, and uterine contraction monitoring was performed during the intervention.[23]

2.3 | Statistical analysis

The Statistical Package for the Social Sciences 21.0 (SPSS, Chicago, IL, USA) for Windows software was used for all statistical analyses. Before the statistical analysis, the Kolmogorov–Smirnov test was used to assess data distribution. Demographic data and clinical baseline variables were compared among the two groups using the independent samples *t*-test for continuous variables and the χ^2-test for categorical variables. A mixed model for repeated measures analysis of variance (rANOVA) was conducted with time (pre-intervention, mid-intervention, and post-intervention) as a within-subject variable and group (motor imagery or control) as a between-subjects variable to analyze the effect of the interventions on the outcomes. The significance level was set at $P<0.05$.

3 | RESULTS

Eighty-six patients with high-risk pregnancies were screened for possible inclusion. Ten patients were excluded for various reasons; as described in the CONSORT flow chart, 38 patients were randomized to the motor imagery group, and 38 patients were randomized to the control group (Figure 1). None of the patients reported any adverse effects or complications during the intervention. The demographic and baseline characteristics of the patients are presented in Table 1. There were no significant differences between groups regarding sociodemographic characteristics and baseline clinical variables.

There was a significant main effect of time in terms of maternal well-being and maternal heart rate ($P=0.001$ and $P=0.015$). The pairwise comparisons for the main effect of time indicated that the significant main effect reflected a significant difference between mid-intervention and post-intervention in terms of maternal well-being, with a mean difference of 2.03 ± 0.23. In addition, the pairwise comparisons for the main effect of time indicated that the significant main effect reflected a significant difference between mid-intervention and post-intervention in terms of maternal heart

TABLE 2 Comparison of maternal well-being, blood pressure, heart rate, oxygen saturation, and uterine contraction between groups.

		Pre-intervention	Mid-intervention	Post-intervention		rANOVA			
								Time	Group
Variables	Group	Mean ± SD	Mean ± SD	Mean ± SD	Mean difference (95% CI)	*P*[a]	ES	*P*[a]	*P*[a]
Maternal well-being	Motor imagery	5.61 ± 2.81	–	8.11 ± 2.08	2.50 (1.84–3.15)	***0.041***	0.05	***0.001***	0.172
	Control	6.68 ± 2.06	–	8.25 ± 1.64	1.56 (0.91–2.22)				
Blood pressure (mmHg)									
Systolic blood pressure	Motor imagery	109.58 ± 15.98	110.95 ± 14.10	108.59 ± 14.69	1.37 (2.06–4.81)	0.803	0.003	0.112	0.385
	Control	107.37 ± 16.24	107.45 ± 15.19	105.80 ± 13.88	1.56 (2.09–5.23)				
Diastolic blood pressure	Motor imagery	65.53 ± 11.19	65.84 ± 10.44	64.73 ± 11.01	0.79 (2.81–4.41)	0.845	0.002	0.393	0.937
	Control	65.87 ± 14.88	65.18 ± 11.83	64.42 ± 12.04	1.45 (2.16–5.06)				
Heart rate (bpm)									
Maternal heart rate	Motor imagery	87.26 ± 10.68	83.87 ± 12.58	87.14 ± 11.14	0.12 (2.72–2.96)	0.486	0.008	***0.015***	0.633
	Control	88.87 ± 11.14	83.00 ± 20.30	89.72 ± 9.96	0.84 (1.99–3.69)				
Fetal heart rate	Motor imagery	142.92 ± 11.21	143.26 ± 12.43	140.57 ± 13.65	2.35 (2.94–7.65)	0.875	0.002	0.334	0.561
	Control	141.37 ± 11.89	141.05 ± 15.38	139.90 ± 15.00	1.46 (3.83–6.76)				
Oxygen saturation (%) and uterine contraction (MVUs)									
Oxygen saturation	Motor imagery	94.76 ± 4.77	95.91 ± 3.57	96.32 ± 3.37	1.39 (0.29–3.08)	0.673	0.005	0.072	***0.025***
	Control	96.24 ± 1.88	97.11 ± 1.92	96.82 ± 1.77	0.58 (1.10–2.27)				
Uterine contraction	Motor imagery	19.13 ± 6.64	18.65 ± 4.60	19.13 ± 5.58	0.003 (2.90–2.91)	0.988	0.001	0.655	0.416
	Control	20.58 ± 10.30	19.89 ± 10.67	20.50 ± 8.71	0.075 (2.83–2.98)				

Note: Data are expressed as mean ± standard deviation. Significant *P*-values are shown in bold italics.

Abbreviations: BPM, beats per minute; CI, confidence interval; ES, effect size; MVUs, Montevideo units; SD, standart deviation.

[a]Mixed model for repeated measures analysis of variance (rANOVA); significance was accepted as $P < 0.05$.

rate, with a mean difference of 4.99 ± 1.95. In contrast, there was a significant main effect of the group on oxygen saturation ($P = 0.025$). Within-group score changes in oxygen saturation were higher in the motor imagery group, with a mean difference of 1.10 ± 0.46. The overall group-by-time interaction for rANOVA was significant for maternal well-being, with an effect size of 0.05 ($P = 0.041$) (Table 2).

4 | DISCUSSION

The findings of the present study pointed out that there was a greater increase in maternal well-being and oxygen saturation in women with high-risk pregnancies participating in the motor imagery-based physical activity program. Following motor imagery-based physical activity, an alteration in systolic or diastolic blood pressure that could lead to high-risk pregnancy was not observed. In addition, it was noted that the motor imagery-based physical activity program did not induce fetal stress, trigger uterine contractions, or result in an abnormal fetal heart rate. Additionally, a tendency towards a decrease in maternal heart rate was observed in both pregnant groups. Uncertainty about the continuity of pregnancy increases anxiety and stress due to a loss of control over life, dependence on others, and various emotions such as fatigue, restlessness, fear, and anger that can occur in high-risk pregnancies.[24,25] In the present study, maternal well-being in both groups increased after the intervention; however, the increase in maternal well-being was greater in the motor imagery group. The fact that both groups performed diaphragmatic breathing exercises might have increased mental and physical relaxation in pregnant women, providing an immediate positive effect on maternal well-being.[26] A decrease in parasympathetic tone during pregnancy has been demonstrated in some studies,[27–29] and any movement of the diaphragm stimulates the vagus nerve, which in turn stimulates the parasympathetic response.[15,30] Moreover, taking into account the positive effects of physical activity on mental health, the implementation of a motor imagery-based exercise protocol is expected to have a beneficial influence on maternal well-being.[31] Furthermore, a recent systematic review indicated that engaging in outdoor exercise has a more significant influence on mental health and overall well-being.[32] In the present study, imagery of physical activities performed outdoors and by the seaside might significantly contribute to increasing maternal well-being compared to only diaphragmatic exercises.

Pregnancy is associated with significant respiratory changes.[33] Abdominal muscles have less tone and activity, making breathing more dependent on the diaphragm in pregnant women.[34] In addition, it has been noted that slow, deep diaphragmatic breathing alters hemodynamic responses in pregnancy hypoxia.[22] Amola et al. (2019) reported that a 4-week diaphragmatic exercise program in the third trimester of pregnancy had a positive effect on respiratory functions, dyspnea, fatigue, and functional capacity.[35] Similarly, in the present study, regardless of time, there was an increase in oxygen saturation in both groups, especially in the mid-intervention. The diaphragmatic breathing exercises in both groups in the study protocol might contribute to the increase in oxygen saturation. However, the change in oxygen saturation in the motor imagery group is higher compared to the control group. This could be associated with the imagery of walking, running, and strengthening exercises in an open and sunny seaside environment and sitting on a bench by the sea in the motor imagery scenario. Numerous neurophysiological studies have shown that motor imagery and motor performance activate similar brain areas (especially the primary motor cortex, supplementary motor area, premotor area, parietal lobe, basal ganglia, and cerebellum).[36,37] The use of diaphragmatic breathing exercises, along with the imaging of outdoor aerobic exercise and strength training scenarios, is likely to stimulate higher respiratory centers in the brain more extensively. Consequently, the group that engaged in motor imagery might have experienced a more pronounced increase in oxygen saturation.

The hemodynamic and autonomic changes during pregnancy might vary more in high-risk pregnancies.[29] Given the obvious connection between mental and physical processes, a person's breathing pattern can affect the level of stress experienced.[15] Slow breathing exercises might decrease sympathetic activity, thus enhancing both physical and mental health.[38] Therefore, diaphragmatic breathing exercises, by regulating decreased parasympathetic activity in women with high-risk pregnancies, might lead to a decrease in maternal heart rate.

To our knowledge, the present study is the first to implement and discuss a motor imagery-based physical activity program in women with high-risk pregnancies, evaluating its safety and efficacy. Furthermore, maternal heart rate, blood pressure, fetal heart rate, and uterine contractions were monitored throughout the intervention to assess whether there were any fetal or maternal health risks. Considering the unaffected uterine contractions and fetal heart rate, as well as the improvement in maternal well-being, motor imagery-based physical activity appears to be a safe therapeutic intervention for women with high-risk pregnancies who have exercise contraindications. However, the most significant limitation of the study is the inability to investigate the long-term effects of motor imagery-based physical activity. The study evaluated the acute effects but did not track the duration of increased oxygen saturation or maternal well-being. It can be considered a potential limitation.

To sum up, the motor imagery-based physical activity program, which has the potential to be used as a self-regulation method for women with high-risk pregnancies, provided a greater improvement in maternal well-being. Motor imagery-based physical activity is a low-cost, non-risky, and simple method that can be self-administered by the patient in high-risk pregnancies where physical activity and exercise are contraindicated. Further research could investigate the long-term effects of motor imagery-based activity on maternal and fetal health in high-risk pregnancies.

AUTHOR CONTRIBUTIONS

Seda Yakıt Yeşilyurt designed, planned, and conducted the study and wrote the manuscript. Tansu Birinci Olgun designed the study, analyzed the data and wrote the manuscript. Seda Ayaz Taş designed, planned, and conducted the study and wrote the manuscript. Gökhan Tosun designed, planned, and conducted the study and edited the manuscript. Mehmet Özer designed, planned, and conducted the study and edited the manuscript, and Nuriye Özengin designed, planned, conducted the study, and edited the manuscript.

CONFLICT OF INTEREST STATEMENT

The authors declare that they have nothing to disclose and that they have no financial or non-financial conflict of interest.

DATA AVAILABILITY STATEMENT

Research data are not shared.

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