

# Effects of Music Therapy and Ball Exercise on Menstrual Discomforts among Women in Their 20s

The purpose of this study was to determine the effects of music therapy and ball exercise on women experiencing menstrual discomforts, thereby identifying the validity of these methods as interventions against menstrual discomforts, with a particular goal of presenting basic data for clinical use.

Twenty university students in their 20s were assigned to two therapy groups in a sequence via simple random sampling; ten subjects attended a ball exercise combined with music therapy group and the other ten subjects attended a music therapy group. Ball exercises were conducted 3 times per week for a total of 12 times, starting from 3 weeks before the expected first day of the menstrual period and ending on the last day of the menstrual period. Similarly, the subjects participated in music therapy by listening to music for 35 minutes per session and 3 sessions per week, starting from 3 weeks before the expected first day of the menstrual period and ending on the last day of the menstrual period.

Five out of six categories of menstrual discomforts were significantly decreased in both music therapy and ball exercise, the exception being changes in the autonomic nervous system, while those in the music therapy group showed a significant difference only in the category of behavioral changes. The results of the present study demonstrate that the ball exercise combined with music therapy more effective in improving menstrual discomforts than the music therapy group.

Key words: *Music Therapy, Ball Therapy, Menstrual Discomforts*

Jung Hyun Choi<sup>a</sup>, Sang Bin Lee<sup>a</sup>,  
Ho Jung An<sup>b</sup>, Ji Sung Kim<sup>c</sup>, Ja  
Pung Koo<sup>d</sup>, Sei Youn Park<sup>e</sup>,  
Nyeon Jun Kim<sup>d</sup>

<sup>a</sup>Namseoul University, Cheonan; <sup>b</sup>Dongnam Health University, Suwon; <sup>c</sup>Suwon Women University, Suwon; <sup>d</sup>Pohang University, Pohang; <sup>e</sup>Yongin University, Yongin

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## Address for correspondence

Nyeon Jun Kim, PT, Ph.D  
Department of Physical Therapy,  
Pohang College, 60, Sinduk-ro,  
Heunghae-eup, Pohang, Korea  
Tel: 82-54-245-1217  
E-mail: knj@pohang.ac.kr

## INTRODUCTION

Some women experience pain or discomfort during their menstrual periods, and menstrual pain is one of the most common symptoms among gynecological diseases. In general, women can feel lower abdominal pain before menstruation begins or within several hours after. Many composite symptoms that appear together with lower abdominal pain are collectively referred to as the premenstrual syndrome, and the discomforts felt in relation to this syndrome are called menstrual discomforts(1).

Menstrual discomforts are phenomena that arise from the repetitive manifestations of a complex cycle of physical, behavioral, and emotional symptoms, typically appearing from 7~10 days

before the menstrual period to the end of the menstrual period(1,2). Quite a diverse range of symptoms appear during this period, including psychological symptoms such as tension, lethargy, anxiety, depression, instability, mood changes, appetite changes, sleep disturbance, and reduction in concentration, and physical symptoms such as acne, headaches, edema, rhinitis, constipation, breast pain, weight fluctuations, burning sensations, lower back pain, sense of abdominal distension, and changes in activity levels(2,3).

The causes of menstrual discomforts can largely be divided into the categories of stress, hormone secretion, composite factors, psychosocial factors, nutrient deficiency, and changes in neurotransmitters(4). Among these, the major cause of menstrual discomforts is stress. As of yet, there is no

definite cure for premenstrual syndrome and most treatment methods focus on relieving physical symptoms alone(4,5).

Among menstruating women, 20~95% suffer from menstrual pain. Of those who suffer from menstrual pain, 30~50% are known to have minor to moderate symptoms while 10~20% are known to experience quite severe to extreme symptoms, some to such an extent that impairs them from their daily life activities(6). Those women who experience menstrual pain may use drug treatments, such as analgesics and oral contraceptives, or non-pharmacological treatments such as rest, exercise, phone therapy, and heat insulation and support in order to relieve symptoms. Among these, analgesics are the most frequently used method for pain relief by women who experience menstrual pain(7). Relaxin, which is secreted 7~10 days before the start of the menstrual period, increases ligament elasticity and joint and cervical movements during the menstrual period, similar to that experienced in pregnancy, thereby reducing the pelvic instability that causes menstrual pain(8). A typical treatment method for pelvic pain is stabilization exercise. Such exercise at the appropriate intensity and during the menstrual period can have a positive effect on dysmenorrhea(9).

Ball exercise is an important activity that can retrain the torso muscles of patients with lower back pain and provide increased stability to the lumbar spinal segments. It is also a low-impact exercise that is more accessible than other equipment exercises, and does not shock the body with its effects(10,11). The purpose of lumber stabilization exercise therapy using exercise balls is not only to maintain muscle strength, endurance, and flexibility, but also to actively extend joint membranes, tendons, and ligaments, as well as increase blood flow to aid in the recovery of damaged regions and prevent the recurrence of lower back pain(12).

Music therapy is a type of phone therapy that reduces pain by diverting attention from external stimuli with music(13). Music therapy has been proven to have such effects as relaxing the mind and body, relieving anxiety, enhancing security, and increasing pain thresholds(13,14). Autonomic nerve reactions to music are not uniform, appearing differently in each individual according to age, sex, body condition, and psychological state, and are greatly affected by personal preference or taste in music. It has been reported that listening to more preferable music brings positive change to the body through the reduction of anxiety, the

stabilization of the mind, and a remarkable decrease in the degree of stress(15,16).

Although many studies have been conducted on menstrual pain, many women still rely on drug treatments. Effective non-pharmacological treatments that enable women to manage menstrual discomforts on their own should be introduced.

Therefore, the purpose of this study is to verify the effects of ball exercise and music therapy on women experiencing menstrual discomforts, thereby identifying the validity of these methods as interventions against menstrual discomforts, with a particular goal of presenting basic data for clinical use.

## METHODS

### Subjects

The subjects of this study are a selection of female students in their 20s from N University located in Chungcheong Province. The selection criteria were as follows: Menstrual cycles had been regular for at least three months and 25~35 days long; Measured score of menstrual pain on the visual analogue scale(VAS) was at least 4.0; Had not been diagnosed with pelvic inflammatory disease or endometriosis; Had not experienced childbirth; Would not take any analgesics or participate in alternative therapy methods, such as hot massages, during the study period; Would not take any oral contraceptives during the study period; Had no experience with ball exercise; Understood the purpose of the study and agreed to participate in the study.

After completing the questionnaire in advance, the study participants were assigned to either the ball exercise with music therapy group(BEMTG) or the music therapy group(MTG) in a sequence via simple random sampling. There was a total number of 20 study participants, consisting of ten in the BEMTG and ten in the MTG. Written informed consent was obtained from each subject. The Ethics Committee of Namseoul University, South Korea approved the study. No study participant dropped out due to such variables as quitting or taking drugs, and all participants completed the experiment in full.

### Experiment Procedure

This study used the Menstrual Distress Questio-

**Table 1.** Participant demographics

Variable	Categories	BEMTG(n=10)		MTG(n=10)		p
		n(%)	M±SD	n(%)	M±SD	
Age(yr)			19.20±1.55		19.00±0.82	.722
Weight(kg)			52.60±7.98		50.50±5.68	.506
First menstruation age(yr)			12.50±2.01		12.50±1.78	1.000
Duration of pain(day)			6.00±1.16		5.30±1.06	.175
Amount of menstruation blood	Much	8(80)		9(90)		.556
	Moderate	2(20)		1(10)		
	Little	0(0)		0(0)		
Smoking	Yes	1(10)		1(10)		1.000
	No	9(90)		9(90)		

**Table 2.** Ball exercise program

	Exercise	Duration
Warm-up	Stretching	5 min.
Ball exercise	Lateral pelvic tilt while sitting on the ball(2 sets x 30 reps)	30 min.
	Lateral pelvic tilt while sitting on the ball (2 sets x 20 reps)	
	Raising one arm and the opposite leg while lying prone on the ball (2 sets x 20 reps)	
	Ball crunches (2 sets x 10 reps)	
Cooldown	Bridge exercise on the ball (2 sets x 10 reps)	5 min.
	Ball leg raises (2 sets x 10 reps)	

nnaire(MDQ), which is a measuring tool for menstrual discomforts modified by Kim(1995). This tool is composed of a total of 35 items in six categories, including concentration, physical pain, behavioral change, negative emotions, moisture accumulation, and autonomic nervous system responses, which was to be scored between 35 points and 210 points. Higher scores indicated more severe menstrual discomforts(17).

As for the experimental procedure, menstrual discomforts were measured before the experiment began and after the intervention was implemented. Changes in menstrual discomforts were measured on the last day of the menstrual period using the same questionnaire as before the experiment began, based on times when the pain was the

more intense during the menstrual period.

The ball exercise program was implemented in the child physical therapy practical room of N University 3 times per week for a total of 12 times, starting from 3 weeks before the expected first day of the menstrual period and ending on the last day of the menstrual period. The subjects participated in the exercise program while wearing casual clothes and listening to their preferred music. The subjects received sufficient education on the exercise movements in advance so that they could more accurately engage in the exercise program, and the subjects were requested to correct their postures during their exercise sessions via continuous feedback.

The ball exercise program used in this study as an intervention method is based on previous studies(21,22); the details are as follows. During the program, there were break times of 10 seconds after each set and break times of 1 minute after each exercise was completed. As for the music therapy, the subjects were instructed to listen to their preferred music in the electrotherapy room of N University for 35 minutes per session and 3 sessions per week, starting from 3 weeks before the expected first day of the menstrual period and ending on the last day of the menstrual period. They were also instructed to prevent themselves from becoming distracted while listening to the music, and an individual space for each subject was made by drawing the curtains in order to promote maximum concentration on the music.

To ensure homogeneity among the subjects' music preferences, a questionnaire was composed with eight questions, three of which came from a questionnaire developed by Hartsock(1982) and modified by Kim and Han(1996), which fit the characteristics of this study and the setting of South Korea. The questionnaire consisted of questions regarding the degree to which the respondent likes music, the number of times the respondent listens to music, the types and forms of music the respondent prefers, the number of times the respondent listens to music when feeling pain, behaviors conducted when feeling pain, and the respondents' desired selection of music, all of which were measured using a Likert scale with a range of 1 point(i.e., "I do not like music.") through 5 points(i.e., "I like music very much.") (18,19). The duration of each music listening session was based on the results of a meta-analysis study on the effect of music therapy, which indicated that

30~40 minutes is the most ideal duration for treating pain(20).

### Data Analysis

The data collected in this study were analyzed using the SPSS 18.0 program. The general characteristics of the subjects were translated into descriptive statistics and homogeneity between the BEMTG and the MTG was verified using the t-test. Intragroup differences from before and after the intervention were analyzed through paired t-tests, and differences in variations between the two groups were analyzed through independent t-tests. The significance level was set to  $\alpha = .05$ .

## RESULTS

Intragroup changes in menstrual discomforts from before and after the intervention are as follows. For the BEMTG, the scores for pain, concentration, behavioral changes, water retention, and negative effects decreased significantly. For the MTG, five out of six categories did not show any significant differences with the exception of significant decreases in the behavioral changes category.

Intergroup changes in menstrual discomforts between before and after the intervention are as follows. Only the item "hot flashes" in the autonomic reactions category showed a significant difference; the remaining items showed no significant differences.

**Table 3.** Comparison of MDQ scores: Pre-post difference in ball exercise group and music therapy group

(unit : Score)

	BEMTG (n=10)		p	BEMTG (n=10)		p
	Pre(M±SD)	Post(M±SD)		Pre(M±SD)	Post(M±SD)	
Pain	18.40±6.06	14.60±5.17	.008*	16.40±3.50	14.40±3.17	.148
Muscle stiffness	3.30±1.42	2.30±1.16	.004*	2.20±1.55	2.20±1.55	1.000
Headache	2.80±1.32	2.90±1.60	.864	2.30±1.34	2.30±1.25	1.000
Cramps	1.70±1.34	1.50±1.27	.443	1.10±0.32	1.40±0.84	.343
Backache	3.60±1.71	2.50±1.58	.075	3.40±1.43	3.30±1.70	.895
Fatigue	4.80±0.92	3.80±1.32	.042*	4.40±1.58	3.40±1.58	.252

**Table 3.** Comparison of MDQ scores: Pre–post difference in ball exercise group and music therapy group (계속)

(unit : Score)

	BEMTG (n=10)		p	BEMTG (n=10)		p
	Pre(M±SD)	Post(M±SD)		Pre(M±SD)	Post(M±SD)	
General aches and Pains	2.20±1.62	1.60±1.08	.329	3.00±1.63	1.80±0.92	.030*
Concentration	20.20±7.33	15.00±3.92	.016*	21.20±9.22	17.30±5.19	.078
Insomnia	2.10±1.20	1.60±0.97	.138	2.30±1.34	1.70±1.25	.239
Forgetfulness	2.50±1.65	2.10±1.37	.443	1.80±1.23	2.50±1.27	.132
Conrusion	1.70±0.95	1.40±0.70	.394	2.20±1.32	2.00±1.33	.343
Lowered judgment	2.30±1.49	2.00±1.33	.656	3.10±1.66	1.90±1.29	.187
Difficulty concentrationg	3.80±1.40	3.00±1.16	.223	3.40±1.90	2.90±1.66	.630
Distractible	2.30±1.42	2.00±1.054	.279	2.90±1.97	2.30±1.64	.081
Accidents	1.70±1.34	1.40±0.70	.394	1.70±0.95	1.50±0.71	.642
Lowered motor coordination	3.80±1.14	1.50±0.71	.001*	3.80±1.81	2.50±1.65	.051
Behavioral change	21.60±4.62	15.40±3.98	.004*	19.50±7.06	13.90±5.11	.016*
Lowered school or work performance	4.60±1.00	4.00±1.25	.279	3.30±1.34	2.80±1.62	.213
Take naps: stay in bed	5.10±0.74	4.10±1.10	.032*	4.20±1.03	2.30±1.25	.004*
Stay at home	3.90±1.29	2.50±1.51	.016*	3.80±2.10	340±1.65	.606
Avoid social activities	4.50±1.58	3.20±1.40	.057	4.30±1.89	3.00±1.25	.051
Decreased efficiency	3.50±1.59	1.60±0.70	.003*	3.90±1.85	2.40±1.71	.009*
Autonomic reactions	8.70±5.06	8.80±3.26	.933	8.90±4.10	7.30±4.06	.256
Dizzinis, faintness	2.90±2.13	2.20±1.32	.285	2.20±1.62	2.10±1.29	.864
Cold sweats	2.10±1.45	2.50±1.51	.494	2.60±1.43	2.20±1.62	.522
Nausea, vomiting	1.90±1.66	1.50±0.92	.534	1.80±1.03	1.40±0.97	.309
Hot flashes	1.80±1.32	2.60±1.71	.070	2.30±1.70	1.60±1.08	.191
Water retention	11.80±3.94	8.90±3.14	.004*	9.60±4.27	9.60±4.14	1.000
Skin disorders	4.10±1.45	3.40±1.71	.089	3.20±1.48	3.50±1.58	.616
Painful breasts	2.60±1.51	1.80±1.62	.121	3.00±1.76	2.80±1.62	.758
Swelling	2.10±1.29	1.60±1.08	.213	1.80±1.75	1.60±1.08	.443
weight gain	3.00±1.56	2.10±1.10	.225	1.60±1.08	1.70±1.06	.780
Negitive affect	24.60±8.02	18.00±4.97	.005*	23.80±9.91	20.30±11.00	.260
Crying	3.10±1.73	2.10±1.20	.015*	2.40±1.43	1.90±0.88	.273

**Table 3.** Comparison of MDQ scores: Pre-post difference in ball exercise group and music therapy group (계속)

(unit : Score)

	BEMTG (n=10)		p	BEMTG (n=10)		p
	Pre(M±SD)	Post(M±SD)		Pre(M±SD)	Post(M±SD)	
Loneliness	3.10±1.37	3.20±1.32	.853	2.40±1.96	2.60±1.58	.780
Anxiety	2.60±1.27	2.20±1.14	.037*	2.80±1.75	2.40±1.65	.534
Restlessness	2.10±1.60	1.90±1.10	.591	1.80±1.03	1.70±1.16	.780
Irritability	4.70±1.49	2.60±0.84	.002*	4.50±1.18	3.30±1.77	.018*
Mood swings	3.50±1.96	2.40±1.65	.137	4.10±1.66	3.30±1.64	.121
Depression	2.90±1.37	1.80±0.63	.040*	3.10±2.18	2.50±1.78	.193
Tension	2.60±1.58	1.80±0.92	.121	2.70±1.42	2.60±1.96	.823

BEMTG: Ball exercise with music therapy group, MTG: Music therapy group

\*p<.05

**Table 4.** Comparison of MDQ scores: Pre-post difference between ball exercise group and music therapy group

(unit : Score)

Contents	BEMTG (n=10)	MTG(n=10)	t	p
	Pre-Post(M±SD)	Pre-Post(M±SD)		
Pain	-3.80±3.52	-2.00±4.00	-1.07	.300
Muscle stiffness	-1.00±0.82	.00±1.63	-1.73	.100
Headache	.10±1.79	.00±0.94	.16	.878
Cramps	-.20±0.79	.30±0.95	-1.28	.216
Backache	-1.10±1.73	-.10±2.33	-1.09	.290
Fatigue	-1.00±1.33	-1.00±2.58	.00	1.000
General aches and Pains	-.60±1.84	-1.20±1.48	.81	.431
Concentration	-5.20±5.59	-3.90±6.19	-.49	.628
Insomnia	-.50±0.97	-.60±1.51	.18	.862
Forgetfulness	-.40±1.58	.70±1.34	-1.68	.110
Conrusion	-.30±1.06	-.20±.63	-.26	.801
Lowered judgment	-.30±2.06	-1.20±2.66	.85	.408
Difficulty concentratong	-.80±1.93	-.50±3.17	-.26	.801
Distractible	-.30±0.82	-.60±0.97	.75	.464
Accidents	-.30±1.06	-.20±1.32	-.19	.854

**Table 4.** Comparison of MDQ scores: Pre-post difference between ball exercise group and music therapy group(계속)  
(unit : Score)

Contents	BEMTG (n=10)	MTG(n=10)	t	p
	Pre-Post(M±SD)	Pre-Post(M±SD)		
Lowered motor coordination	-2.30±1.49	-1.30±1.83	-.134	.197
Behavioral change	-6.20±5.05	-5.60±6.02	-.24	.812
Lowered school or work performance	-.60±1.65	-.50±1.18	-.156	.878
Take naps: stay in bed	-1.00±1.25	-1.90±1.60	1.41	.177
Stay at home	-1.40±1.51	-.40±2.37	-1.13	.274
Avoid social activities	-1.30±1.89	-1.30±1.83	.00	1.000
Decreased efficiency	-1.90±1.52	-1.50±1.43	-.61	.553
Autonomic reactions	.10±3.64	-1.60±4.17	.97	.344
Dizziness, faintness	-.70±1.95	-.10±1.79	-.72	.482
Cold sweats	.40±1.78	-.40±1.90	.97	.343
Nausea, vomiting	-.40±1.96	-.40±1.17	.00	1.000
Hot flashes	.80±1.23	-.70±1.57	2.38	.028*
Water retention	-2.90±2.42	.00±3.92	-1.99	.062
Skin disorders	-.70±1.16	.30±1.83	-1.46	.161
Painful breasts	-.80±1.48	-.20±1.99	-.77	.454
Swelling	-.50±1.18	-.20±0.79	-.67	.512
weight gain	-.90±2.18	.10±1.10	-1.29	.218
Negative affect	-6.60±5.68	-3.50±9.22	-.91	.377
Crying	-1.00±1.05	-.50±1.35	-.92	.369
Loneliness	.10±1.66	.20±2.20	-.12	.910
Anxiety	-.40±0.52	-.40±1.96	.00	1.000
Restlessness	-.20±1.14	-.10±1.10	-.20	.844
Irritability	-2.10±1.60	-1.20±1.32	-1.38	.186
Mood swings	-1.10±2.13	-.80±1.48	-.37	.719
Depression	-1.10±1.45	-.60±1.35	-.79	.435
Tension	-.80±1.48	-.10±1.37	-1.10	.286

BEMTG: Ball exercise with music therapy group, MTG: Music therapy group  
\*p<.05

## DISCUSSION

In this study, ball exercise and music therapy programs were implemented with female university students in order to verify the effects of these methods on women who periodically experience menstrual discomforts. A major cause of dysmenorrhea is uterine contractions, and pain occurs when pressure in the uterus reaches 200~300mmHg during a contraction, which leads to a decrease in blood flow within the uterus(2,3).

When Kang(2008) implemented a yoga exercise program for female university students over a period of four weeks, the participants of that experiment who complained of menstrual discomforts showed significant improvement in all categories, compared to the control group that did not receive any intervention. This result can be attributed to the fact that the yoga postures helped the subjects adapt to changes in their musculoskeletal systems, increasing the flexibility and strength of their pelvic and abdominal muscles(23). This is similar to the results of this study, which showed that the BEMTG enjoyed significant improvements in five out of six categories for menstrual discomforts, with the exception of the category for changes in the autonomic nervous system. The BEMTG showed more positive results than the MTG, which can be attributed to increases in flexibility and strength of pelvic and abdominal muscles resulting from the four weeks of ball exercise. In addition, Kim and Kim(2012) implemented lumbopelvic stabilization exercises for female university students and the results showed an overall reduction in menstrual discomforts(24). Similarly, this study showed that the decreased menstrual discomforts experienced by the BEMTG can be attributed to the fact that ball exercise corrects unstable pelvises and reduces uterine contractions, thereby leading to increases in blood flow within the uterus(2,8,9).

Son et al.(2012) also conducted music therapy in which patients with complex regional pain syndrome listened to their preferred music; the results showed decreases in pain scores, but the differences were not statistically significant(25). In addition, Kim et al.(2007) implemented music therapy to compare the pain and the degree of exercise performance of patients who had undergone abdominal surgery. In the results, the experimental group who received music therapy showed

higher degrees of pain relief on the first day following surgery, when compared to the control group who did not receive any intervention, but the degrees of pain relief did not show a significant difference between the experimental group and the control group on the second and third days following surgery(26). In this study, although the premenstrual syndrome score in the MTG decreased from 99.00 points( $\pm 33.83$ ) before the intervention to 84.40 points( $\pm 36.77$ ) after the intervention, this difference is not statistically significant. This result can be attributed to the fact that the effects of music therapy on the autonomic nervous system and related to pain are not uniform; they are diverse and depend on the tastes, constitutions, and mood changes of individual subjects.

It is a proven fact that music affects the rhythms and functions of the human brain. Music acts on a very simple physiological level, capable of maintaining muscle activities, providing feedback for interactions between different muscles, and supporting energy flow into the body, thereby having a positive effect on physical activities and emotions(27,28). As with previous studies, the results of this study in which the BEMTG showed a significant relief of premenstrual syndrome compared to the MTG can be attributed to the fact that the performance of ball exercise combined with music listening had activated the sympathetic nerves in the subjects' autonomic nervous systems, which aided motility and lead to increases in the exercise's effects(15,16,30).

Since this study limited its subjects to female university students in their 20s, the results cannot be applied freely to women in all age groups. Therefore, in order to generalize the results, additional studies that can secure more subjects in different age ranges are necessary. In addition, since the experimental intervention period lasted only one month, which is relatively short, a long-term study should be conducted in order to measure whether there are any persisting effects after the ball exercise intervention. Furthermore, there is a need to actually measure changes in the activity and strength of muscles in the lumbopelvic region in order to check whether the lumbopelvic region was stabilized by the ball exercise. This can provide a more clear study direction on the effects of ball exercise on menstrual pain and premenstrual syndrome.



## CONCLUSIONS

This study was conducted to measure and verify the effects of music therapy and ball exercise on menstrual discomforts, involving a participant group of female university students in their 20s.

According to the results, menstrual discomforts experienced by the ball exercise with music therapy group showed significant decreases in five out of six categories, the exception being changes in the autonomic nervous system, while those in the music therapy group showed a significant difference only in the category of behavioral changes, with no significant difference in the remaining five categories. It seems the ball exercise with music therapy group experienced a more positive effect than the music therapy group; therefore, the combination of ball exercise and music therapy should be considered as a non-pharmacological and easily-applied treatment for female university students who feel discomfort due to menstrual pain.

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