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The Effects of 8-week Pilates Mat Exercises on the Body Composition and Level of Satisfaction of Female College Students

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Abstract

The purpose of this study is to identify the effects of pilates exercises on the body composition and satisfaction level of female college students, and, to do so, pilates classes were provided for female college students for 8 weeks. Their level of satisfaction was surveyed and their body composition before and after participating in the classes was also measured. Out of a total of 40 subjects, those who did not diligently participate in the pilates classes were excluded, and the data of 22 subjects who continued to participate in the classes were analyzed only. The components of body composition measured before and after the 8-week pilates exercise program showed that body fat percentage and abdominal fat percentage were reduced, while lean body mass increased. The level of satisfaction of the group of those who performed pilates exercises for 8 weeks showed positive effects. It will be necessary to develop various systematic and science-based pilates exercise programs that are customized for different age groups in order to reduce the level of the components of body composition associated with obesity.

Keywords: Pilates exercise, 8 weeks, body composition, satisfaction, female college student

1. Introduction

As people's perception that a beautiful and healthy body is the most important value in their life has widely spread, a well-being culture that pursues a happy life through physical and mental health has rapidly emerged recently [1]. This is well reflected in the definition of well-being by the World Health Organization (WHO) - a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity [2]. People's interest in health promotion raised by this well-being culture has increased their participation and interest in exercises regardless of their age, and has improved the quality of life through active participation [3].

Another thing that should not be overlooked will be leading a happy life with a personal pleasure in college years, the golden years of life. That is, it is necessary not only to address the stress, tension and conflicts that people experience in school life, but also to improve the quality of life and to participate in active and creative activities [4]. At this time, however, college students in Korea mostly spend time only on acquiring knowledge, leaving romance, emotions and self-fulfillment in their college life behind due to unemployment problems.

Pilates is a physical fitness system developed by Joseph Hubertus Pilates, a German American physical trainer, in the early 20th century [6]. He had a congenitally weak constitution, suffering from rickets, asthma and rheumatic fever. He did not neglect hot-spring therapy and exercises in order to maintain his health, and developed and distributed a physical fitness system, founding the world's first mat exercise [6].

Various new exercises to promote health and relieve stress have been introduced [6] [7], and pilates exercise

programs have gained a sensational popularity in the United States as well as in Korea [8]. It has been reported that pilates exercises improve pilates practitioners' physical self-concept, psychological well-being and subjective feeling of happiness [9] [10], body composition and self-esteem [11] [12] [13], body composition, physical strength and flexibility [14] [15] [16] and serum lipid and immune globulin [17], and reduce their obesity and chronic back pain [18] [19].

Pilates education provides individuals with an opportunity to control emotions, to address stress with the feelings of success and satisfaction, and to achieve emotional stability and satisfy their desire for self-satisfaction with an active and dynamic attitude toward life, gaining a foothold for self-conquest [20]. In other words, stress or tension raised by others can be controlled and relieved by their own efforts and activities, and thus the characteristics of the nobility of humans and their genuine personality can be emphasized, which turns them into a motivated and adventurous human character and paves the way for a desirable social life and relationships [4].

Pilates techniques have been continuously developed with the aim of correcting postures based on six principles (concentration, center, control, precision, breathing and flow) [8] [21] [22].

Earlier studies mostly focused on the positive effects of the combination of aerobic and resistive exercises [11] [14] [23] [24], and a few studies on pilates have been published recently. However, there is almost no study on changes in body composition and satisfaction after performing mat exercises.

In this study, pilates exercises were provided for 8 weeks for female college students in their 20s who are interested in appearance, tend to show physical damage and decrease in confidence, if failed to properly control, and exercise less regularly than young males, and changes in their body composition and satisfaction level were measured.

2. Research methods

The purpose of this study was explained to female college students who did not have any experience of pilates from January to March, 2018, and 40 students who actively and voluntarily expressed their intention to participate in this study were selected and provided with pilates classes for 8 weeks. The components of their body composition and waist were measured and compared before and after performing the exercises. After the pilates exercise program, their level of satisfaction in daily life was surveyed using a questionnaire. Out of a total of 40 subjects, those who did not diligently participate in the pilates classes were excluded, and the data of 22 subjects who continued to participate in the classes were analyzed only.

2.1 Test items and methods

1) Waistline

The waist of subjects was measured with a tapeline at the height of the umbilicus.

2) Body composition

The various components of body composition including body fat percentage (%fat), body mass index (BMI), muscle mass (kg) and abdominal fat percentage were measured under the same environmental conditions using Inbody 3.0 (Biospace, Korea).

3) Satisfaction

The level of satisfaction in daily life of 22 female students of M college who diligently participated in the pilates exercise program was measured using a questionnaire composed of 14 items.

2.2 Pilates exercise program

The pilates mat exercise program was provided for subjects twice a week, 60 minutes per day for 8 weeks and the program was composed of warm-up, main and cool-down phases. In terms of the exercise intensity of the program, the medium intensity of 60~80% HRmax (ACSM, 2005) is recommended to achieve weight-loss effects related to obesity.

Prior to the main exercise program, the first week was used as an adaptation period, and after that the load of exercises was gradually increased. The detailed schedule of the program is as shown in Table 1.

Table 1. Pilates mat exercise program

Program level	contents
warm up (10 min)	1. Breathing: 2reps-2sets
	2. The bridge: 2reps-2sets
	3. roll-up: 3reps-2sets
	4. quadruped: 3reps-2sets
	5. prone press up: 3reps-2sets
beginners	1. Hundred: 10reps-3sets
	2. one leg stretch: 2reps-4sets
	3. the roll over: 2reps-4sets
	4. the roll up: 2reps- 4sets
	5. single straight leg stretch : 2reps- 8sets
	6. single leg kick: 4reps-4sets
	7. leg circles: 2reps-2sets
main exercise (40min)	1. Hundred: 10reps-5sets
	2. double leg stretch : 2reps-6sets
	3. the roll over : 2reps-6sets
	4. the roll advanced : 2reps-6sets
	5. the criss cross : 2reps-6sets
	6. double straight leg stretch : 2reps- 10sets
	7. double leg kick : 4reps-4sets
	8. leg circle : 2reps-4sets
advanced	1. Hundred : 2reps-2sets

	2. one leg stretch : 2reps-4sets
	double leg stretch: 2reps-6sets
	3. the roll over1 : 2reps-6sets3.
	over1: 2reps-6sets3.
	4. the roll up: 2reps-4sets
	5. single straight leg stretch : 2reps- 8sets
	6. single leg kick : 4reps-4sets
	double leg kick : 2reps-4sets
	7. the criss cross : 2reps-6sets
	8. leg circle : 2reps-4sets
	1. side kick : 2reps-4sets
	2. mermaid: 2reps-4sets
	3.spine stretch: 2reps-4sets
cool down (10min)	4. spine twist: 2reps-4sets
	5. side bending balance with parallel hip flexion : 2reps-4sets
	6. side bending balance with parallel hip extension : 2reps-4sets

2.3 Data processing

The mean value (M) and standard deviation (SD) of all the variables examined in this study were calculated using Windows SPSS Ver 12.0, a statistical program. Differences between before and after performing exercises at each measurement time for each group were verified by analyzing data measured before performing the exercises and at a certain time using a paired t-test. In order to compare differences between groups considering the time of measurement, a two-way ANOVA with repeated measures was used, and those that showed a statistically significant difference were analyzed using a LSD (least significant difference) post-hoc test. The statistically significant level was $\alpha = .05$.

Data on the level of satisfaction in daily life of subjects that were collected through a questionnaire were analyzed using percentages based on the frequency of each survey item.

3. Research results

In this study, the components of body composition and the level of satisfaction of female students who participated in the pilates exercise program provided in this study were assessed before and after the program. The components of body composition including body fat percentage, lean body mass, body mass index, abdominal fat percentage and muscle mass were measured and analyzed, and their level of satisfaction was surveyed using a questionnaire composed of several items (Table 2).

Table 2. General characteristics

Group	Age(yr)	Height(cm)	Weight(kg)
P(n=22)	25.09±5.9	158.87±7.63	55.24±19.26

The average age of 22 female college students was 25 years, and the average height and weight were 158.87cm and 55.24kg.

3.1 Analysis results of body composition

The components of the body composition of subjects measured using Inbody 3.0 include body fat percentage (%fat), lean body mass (LBM, kg), body mass index (BMI, %), muscle mass (kg), basal metabolic rate (BMR, kcal), and abdominal fat percentage (%) (Table 3).

Table 3. Body fat, body mass index, abdominal fat

	Before	After	t-value	P
Body fat (%)	26.76 (4.226)	25.20 (4.794)	3.814	.001
Body mass index (kg/m²)	20.92 (2.463)	20.70 (2.559)	1.574	.223
Abdominal fat (%)	.805 (.031)	.791 (.035)	4.215	<.001

As shown in Table 3, statistically significant differences were observed in the results of body fat percentage (t=3.814, p=.001) and abdominal fat percentage (t=4.215, p<.001), but there was no statistically significant difference in the results of body mass index (t=1.574, p=.130). That is, after participating in pilates exercises, the body fat percentage and abdominal fat percentage of subjects were reduced by about 1.6% and 0.01% respectively.

These results indicate that pilates exercises can result in changes both in body fat percentage and abdominal fat percentage.

3.1.1 Analysis results of body fat percentage, muscle mass and basal metabolic rate

The compared results of the lean body mass, muscle mass and basal metabolic rate of subjects before and after participating in pilates exercises were as shown in Table 4.

Table 4. Comparison of basal metabolic rate, muscle mass and lean body mass before and after pilates exercises

	Before	After	t-value	P
Lean body mass (kg)	40.90 (7.018)	41.46 (6.997)	-2.709	.013
Muscle mass (kg)	39.66 (6.622)	40.86 (7.925)	.844	.413
Basal metabolic rate (kcal)	1377.99 (135.24)	1453.65 (169.50)	-1.228	<.223

As shown in Table 4, there was no statistically significant difference in the results of muscle mass ($p=.413$) and basal metabolic rate ($p=.223$), while there was a statistically significant difference in the results of lean body mass ($t=-2.809$, $p=.013$, $\alpha=.05$). That is, the lean body mass of subjects after participating in pilates exercises increased by about 0.56kg.

3.2 Satisfaction in daily life

After performing pilates exercises for 8 weeks, the level of satisfaction in daily life of subjects was surveyed using a questionnaire (Figure 1~7).

The surveyed results of 22 female college students who diligently participated in pilates classes were analyzed and the share of those who answered 'agree' to the question 'I felt less fatigue in daily life' was the highest (54.55%). The share of those who answered 'strongly agree' to the question 'it became easier to do abdominal breathing' was the highest (54.55%), and 72.73% of the subjects answered 'agree' to the question 'I felt more comfortable when defecating and urinating.' The share of those who answered 'agree' to the question 'I felt physical changes' was the highest (36.36%). In addition, subjects showed in general positive responses to the rest questions.

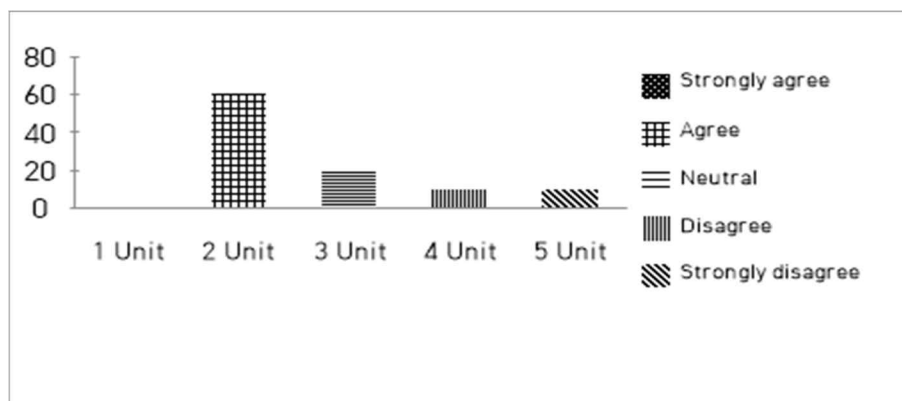


Figure 1. I felt less fatigue in daily life.

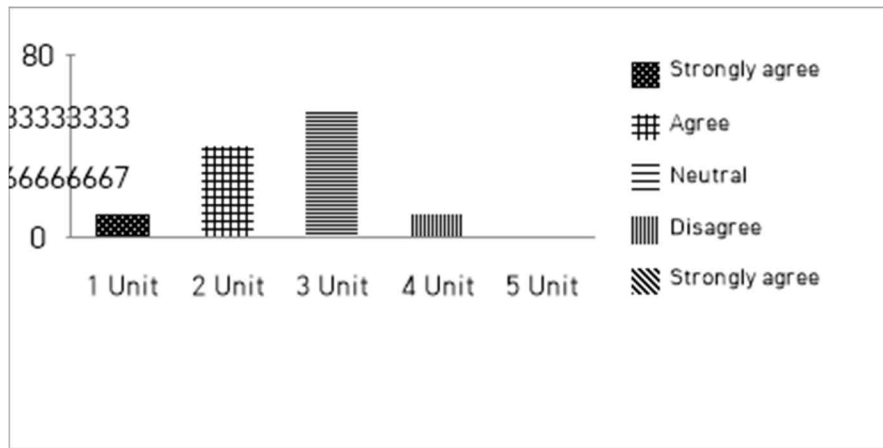


Figure 2. I felt emotionally stable

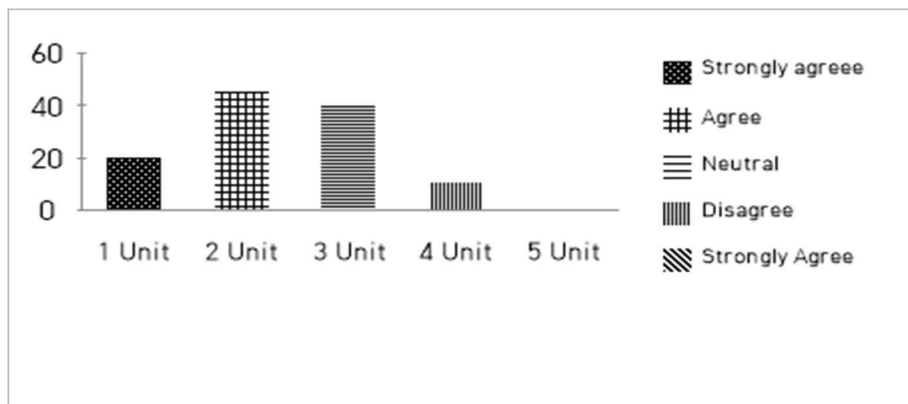


Figure 3. My physical flexibility increased.

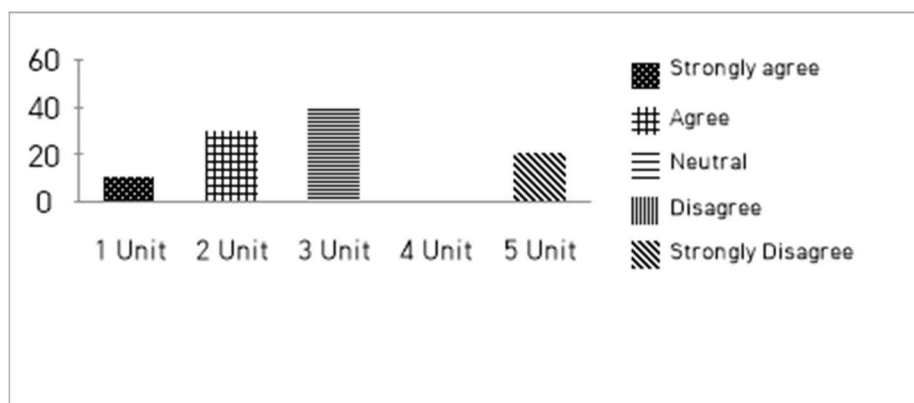


Figure 4. It became easier to do abdominal breathing.

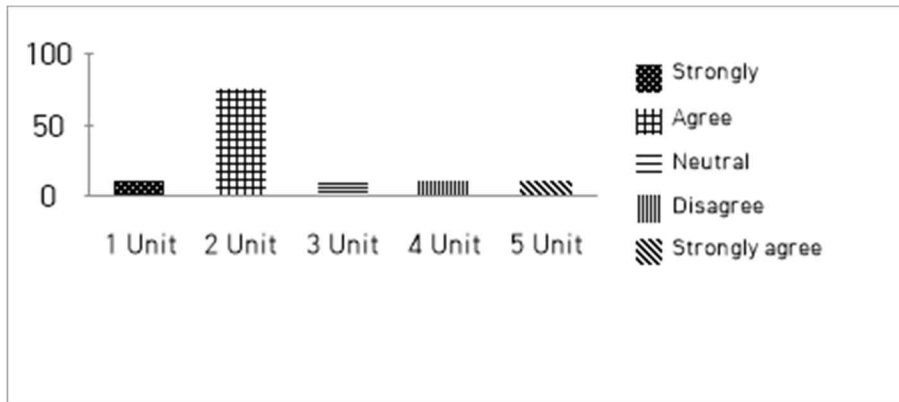


Figure 5. I felt more comfortable when defecating and urinating.

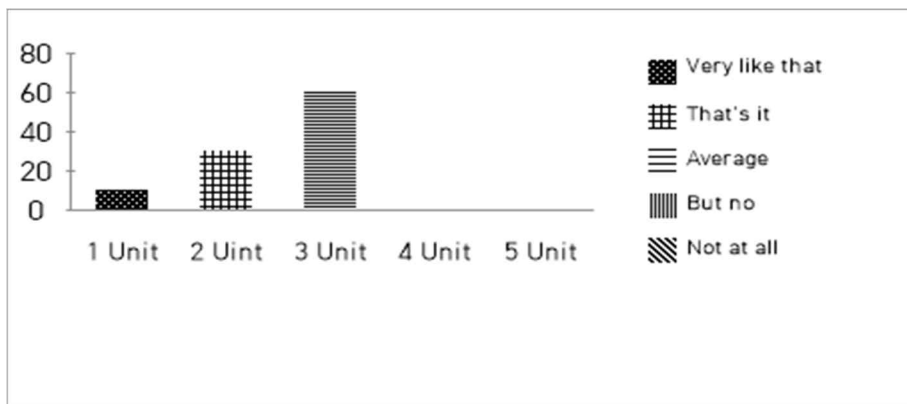


Figure 6. I slept well at night after exercises.

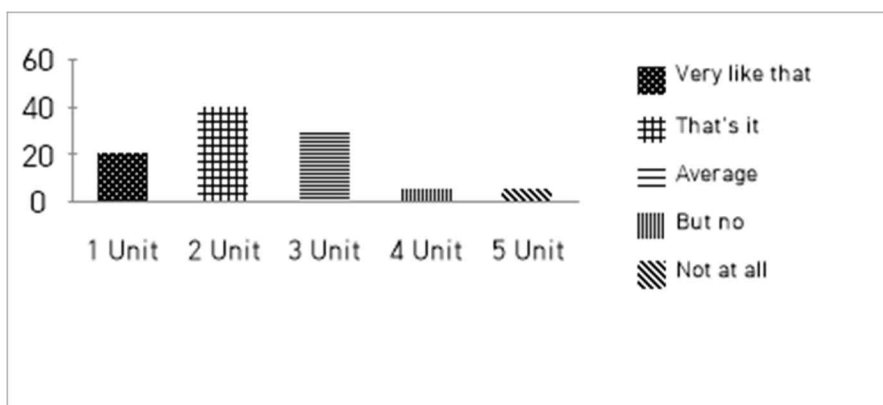


Figure 7. I felt physical changes.

4. Discussion

In this study, pilates classes were provided for female students of M college who sensitively respond to physical health and body shape for 8 weeks in order to identify the effects of 8-week pilates classes on the body composition of female college students and their level of satisfaction. The results showed that positive effects on the level of satisfaction in daily life were observed, but there was no distinct change in the components of body composition.

The results of their satisfaction in daily life were similar to those of earlier studies that participation in pilates classes had positive effects on mental health such as acting as a buffer in stressful situations, and that exercises had very positive effects particularly on those in their 20s [15] [25] [26] [27]. Physical activities like pilates exercises have been suggested as an important factor in satisfaction in daily life, and have been reported to have a positive correlation [26] [28] [29] [30]. As such, physical activities seem to be effective in improving the quality of life.

In terms of the components of body composition, the body fat percentage and abdominal fat percentage of subjects were reduced. The results were similar to the results of an earlier study conducted among middle-aged females (Hong et al.) [31] that their body fat and abdominal fat percentage were reduced, but Hong et al. reported that there was no significant difference, which is slightly different from the results of this study. This can be attributed to differences in the intensity of pilates exercises and subjects. In addition, the body mass index (BMI) of subjects in this study was reduced, but did not show any statistically significant difference.

The results of this study were similar to those of earlier studies that observed adults aged 18 and over [23] [32], and the studies reported that the level of components such as body fat, weight and lean body mass was reduced, but that there was no statistically significant difference. However, other studies conducted among teenage girls [12] [13] [33] reported that their body mass index (BMI) was statistically significantly reduced, which is different from the results of this study. The differences can be attributed to the facts that they were conducted among different subjects and that their pilate exercise programs were not identical.

Kallander [34] provided males and females in the early 30s with pilates classes for beginners and intermediates twice a week for 7 weeks. In the study, pilates exercises were suggested as an exercise program effective in reducing obesity, since body weight can be reduced through pilates exercises. As such, pilates exercise programs customized for different age groups are expected to improve the components of body composition and thus to reduce obesity more effectively. In this study, however, it was difficult to obtain positive changes in body composition with participating in pilates exercises twice a week for 8 weeks only. which highlights the necessity of developing more long-term and systematic exercise plans. Therefore, it will be necessary to develop various systematic and science-based pilates exercise programs that are customized for different age groups in order to reduce the level of the components of body composition associated with obesity.

There were still some limitations in this study. First, this study was conducted only among female college students, and their behaviors in daily life such as diet, taking medicine, smoking and drinking were not controlled. Second, pilates mat exercises were provided only twice a week, and the intensity and frequency of exercises were not controlled consistently.

5. Conclusion

The purpose of this study was to identify the effects of pilates exercises on the body composition and satisfaction level of female college students, and, to do so, pilates classes were provided for female college students for 8 weeks. Their level of satisfaction was surveyed and their body composition before and after participating in the classes was also measured, and the following conclusions were obtained. The components

of body composition measured before and after the 8-week pilates exercise program showed that body fat percentage and abdominal fat percentage were reduced, while lean body mass increased. The level of satisfaction of the group of those who performed pilates exercises for 8 weeks showed positive effects.

Since it is difficult to see positive changes in body composition with participating in exercises only twice a week for 8 weeks, more long-term and systematic plans need to be provided. Therefore, it will be necessary to develop various systematic and science-based pilates exercise programs that are customized for different age groups in order to reduce the level of the components of body composition associated with obesity.

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