

Effect of Pilates ·Yoga complex treatment on Body Image, Muscle Mass and Basal Metabolism in Female College Student

Sun-Ho Kim¹, Jae-Kwang Sul²

^{*1} Professor, Dept. General Education, Nambu University, Gwangju, 506-706 Korea

² Professor, Dept. Taekwondo, Chunnam Techno University, Okgwa-myeon, 516-911 Korea

sunho100@hanmail.net^{*1}, sjk0383@hanmail.net²

Corresponding author*: Sun-Ho Kim, sunho100@hanmail.net

Abstract

Background/Objectives: Most women are doing various actions necessary for body shape management according to the degree of body satisfaction. However, wrong body shape management can harm physical health and cause psychological stress as a side effect resulting in limitations on social life. The aims of this research is to find out which influence of regular physical activities how it works on related factors such as skeletal muscle mass, basal metabolism and physical satisfaction factors in young women.

Methods/Statistical analysis: A complex treatment exercise was conducted for 21 female college students (22.26±1.24yrs, 162.7±3.17cm, 61.2±5.33kg) participating in the health care program. Skeletal muscle mass, basal metabolism, and body image were measured and analyzed during 12 weeks of complex treatment exercise (Pilates & Yoga). All data were verified through error-test to maintain the accuracy of data analysis, and t-test of the corresponding sample was used to verify and analyze the differences before and after exercise. Also, the correlation between variables was validated through Pearson correlation analysis.

Findings: Skeletal muscle mass, basal metabolism, and physical satisfaction showed positive changes after participation in complex treatment exercise. It shows significant results that skeletal muscle mass, basic metabolism, and body image factors (body attractiveness, fitness & physical activity, and importance of body shape) are related to the normal correlation, and basic metabolism and body image factors are same as well. Meanwhile, the inverse correlation between skeletal muscle mass and body image factors (feeling of obesity, obesity of the lower body and body disparagement), and the correlation between the base metabolism and physical image factors are same as well. As mentioned above, regular participation in physical activity has a positive effect on skeletal muscle mass, basal metabolism and body satisfaction of young women.

Improvements/Applications: Therefore, people of younger age group need to form healthy lifestyle habit regularly participating in physical activities to properly manage various stresses and future health.

Keywords: Complex exercise, Skeletal muscle mass, Basal metabolism, Body image, Physical satisfaction.

1. Introduction

The meaning of health is defined as a harmonized state in terms of physical, psychological and social, not merely the absence of illness or feeble. That is, social and psychological aspects are very important for good health as well as health-related fitness. Interpersonal relationship, dissatisfaction with society, anxiety, depression, stress, self-esteem, body image, image of the body and trauma are typical examples of this social and psychological area.

Mass media have a great influence on everyday life of all age groups in modern society and play a significant role in forming the image of one's body. Body image is the attitude and feeling about body in every single mind as a part of the self-concept. It is influenced by mass media, family and surroundings, peers and socio-cultural impacts[1].

The degree of body dissatisfaction is high among young people worldwide. In particular, younger women are dissatisfied with the difference between their physical appearance and the body image that is socially and culturally demanded, using various harmful methods to their health in order to change themselves to fit social standard.

The distorted body image brings about a wrong judgement like you think you are fat even though you are actually thin. Such mis-judgement causes social pathologies such as loss of self-control, inferiority, confusion of self-identity, fear, binge eating, vomiting, amenorrhea, food rejection, weight loss, nutritional imbalance and anxiety. In addition, long-term chronic dissatisfaction with body image not only leads to low self-esteem, but also excessive stress and negative perception and feeling toward society and individuals. Accordingly, it is important establishing a correct physical image for a healthy social life[2].

It has been reported that health-related fitness levels, disease or surgery experience, chronic illness and low body image

have a high correlation, and incorrect image of specific body part have a negative effect on the body image.

In recent years, it is recommended for young people to participate in physical activities regularly as a means to increase satisfaction with the body because high correlation is shown between body image and body composition. It is also reported that the scientific exercise program improves satisfaction with body image, and physical activity is closely related to maintaining the best health and also plays a very important part in mental health. In line with this, more and more people are participating in Yoga and Pilates, a form of exercise that combines mental aspect and physical activity element for health care and physical dissatisfaction[3, 4].

As described in the above, it has been reported that regular Yoga-Pilates exercise is effective in strengthening mental, physical and social-cultural adaptability. However, research on a complex treatment exercise program combining Pilates and Yoga exercise has been very rare. Therefore, it is considered to be meaningful to find out how combined movement with Pilates-Yoga affects the physical image, muscle mass and basic metabolic rate of college girls. .

2. Materials and Methods

2.1. Subjects

Subjects of this research are 32 female college students who voluntarily agreed to participate in this experiment among applicants for the body shape management program which is a liberal arts subject at O University. They were clinically healthy without musculoskeletal disorder and metabolic disorder, and 30 participants among them were selected with no experience of smoking, drug use, and participation in elite sports. Next, 29 participants without any specific health problem for exercise program were selected. During this research period, they were trained to understand and practice behavior pattern that could affect the result. All participants signed the informed consent, and those who did not faithfully implement the exercise program during the 12 week research period were excluded, and then finally 21 participants(22.26±1.24yrs, 162.7±3.17cm, 61.2±5.33kg) were enrolled.

2.2. Experimental procedure & Design

Dependent variables were measured by performing 12 weeks of main exercise (Pilates & Yoga) after 1 week of preliminary exercise for adaptation to test and treatment. Among dependent variables, dissatisfaction with the body was limited to body image, skeletal muscle mass for muscle mass, and basal metabolism for daily metabolism. The measurement of the dependent variables was done two times before exercise and 12-weeks after exercise.

At a frequency of once a week(Wednesday), 90 minute-exercise consisting of warm-up (10 minutes), main exercise (70 minutes) and cooling-down (10 minutes) was performed once. Voluntary participation in exercise(Pilates + Yoga movement) twice a week (Monday, Friday, or Weekend) was allowed at home or in the accommodation. The exercise program (Pilates such as rolling, leg stretching, double leg stretching, hundred, rolling up, crisscross, corkscrews, double leg kicks, teaser, leg full stop, and Yoga such as halasana, suriya namaskara, virabhadrasana 1-3, ardha chandrasana, natarajasana, paripurna navasana, purvottanasana, vrksasana, garudasana, utthita trikonasana) was reconstructed based on the motions of Uluğ et al.[5] . The intensity of exercise was set using RPE (Perceived Rate of Exertion) to the extent that the participant feels comfortable based on previous studies of Marshall & Murphy[6]. Specifically, exercises were performed at an intensity of 11~12 with no feeling of discomfort and pain during 1~6 week, and at an intensity of 13~14 during 7~12 week.

For the questionnaire, the researcher requested the cooperation to the participants first and distributed the questionnaire, and then collected shortly after completing questionnaire by self-evaluation method. The questionnaire relating to body image was measured using the method developed by Ben-Tovin & Walker[7]. Ben-Tovin & Walker[7] questionnaire is a self-assessment reporting tool consisting of 44 questions for women to assess their physical appearance and the internal function of body. The questionnaire consists of six sub-scales such as: feeling of obesity, declining one's own body (body disparagement), importance of body weight and body shape in an individual's life (importance of weight and body shape), attractiveness of the body perceived by participants (body attractiveness), feeling that own thigh and buttocks are obese (lower body obesity), self-evaluated feelings about fitness and physical exercise (fitness and physical exercise). However, 30 items were reconstructed based on the questionnaire items of Ben-Tovin & Walker[7] in this study. The questionnaire consists of 30 questions in total: 4 items relating to feeling of obesity, 6 items relating to body disparagement, 6 items relating to importance of weight and body shape, 6 items relating to body attractiveness, 3 items relating to obesity of lower body, and 5 items relating to fitness and physical exercise.

In addition, muscle mass was measured using In-Body 720, a bio-impedance device using a direct multi-frequency measurement method for each part. The participant's height, gender, and age were entered together, and the fingers and ankles were wiped with an electrolyte towel to step on the measurement equipment. The thumb was placed on the upper round hand electrode, and the remaining four fingers were all wrapped around the lower elongated electrode, and then the elbow was extended so as not to contact the armpit and body, and held comfortably for about 15 seconds. The basal metabolism at rest was measured using In-Body 720. The basal metabolic value measured in In-Body 720 was calculated through Cunningham[8] formula. This is based on the theory that basal metabolism is closely related to lean mass (muscle mass) because it is mainly used for muscle metabolism {BMR = 370 +(LBM × 21.6)}. In order to reduce the measurement error of the dependent variable, it was measured by one trained health-exercise manager.

2.3. Statistical analysis

Measurements obtained in this research was calculated using the SPSS Ver.20.0. All data were verified through error-test to maintain the accuracy of the data analysis, and t-test of the corresponding sample was used to verify and analyze the differences before and after exercise. Also, the correlation between variables was validated through Pearson correlation analysis. All statistical significance level was set as $\alpha=.05$.

3. Results and Discussion

In this study, the difference in dependent variables after participation in Pilates and Yoga complex treatment program was analyzed for young female college students through t-test of the corresponding sample, and the relationship between body image, skeletal muscle mass and basal metabolism were analyzed through correlation analysis, and the following results were identified.

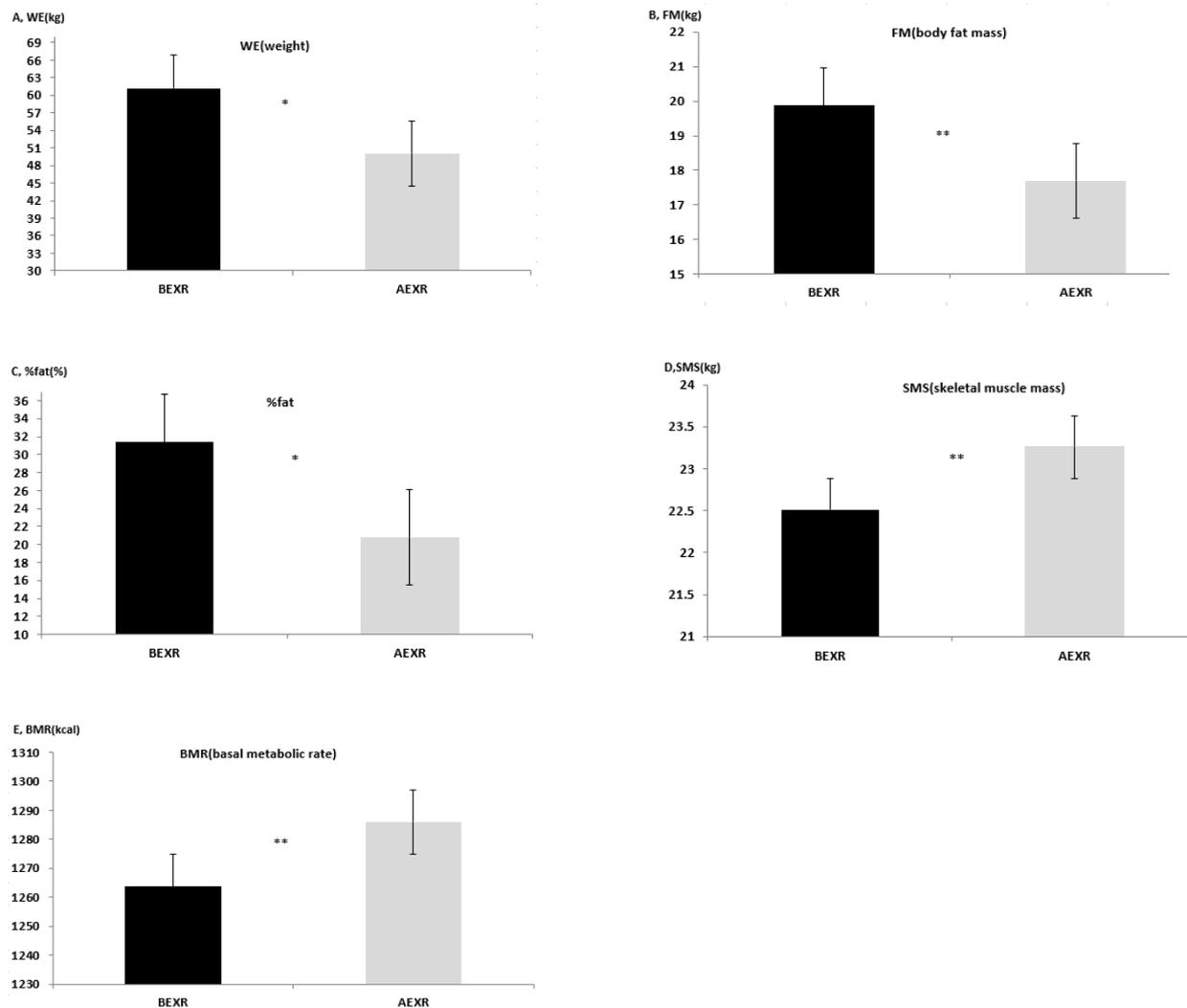


Figure 1. Dependent Variables1 according to complex treatment exercise

Values are means \pm SEM. *,**Significant different among groups ($p < .05$, $p < .01$), A; weight, B; body fat mass, C; %fat, D; skeletal muscle mass, E; basal metabolic rate, BEXR; before exercise, AEXR; after exercise.

As shown in Fig. 1 and Fig. 2 among the six sub-factors related to body image, satisfaction with physical attraction, degree of physical disparagement, importance (satisfaction) of body shape, and importance of fitness (physical exercise) after participation in the complex treatment exercise showed a significant change. The feeling of obesity and the degree of lower body obesity tended to improve, respectively, but there was no significant change. Also, weight, fat mass, %fat, muscle mass and basal metabolism among the daily metabolism after participation in complex treatment exercise showed significant differences ($p < .05$, $p < .01$).

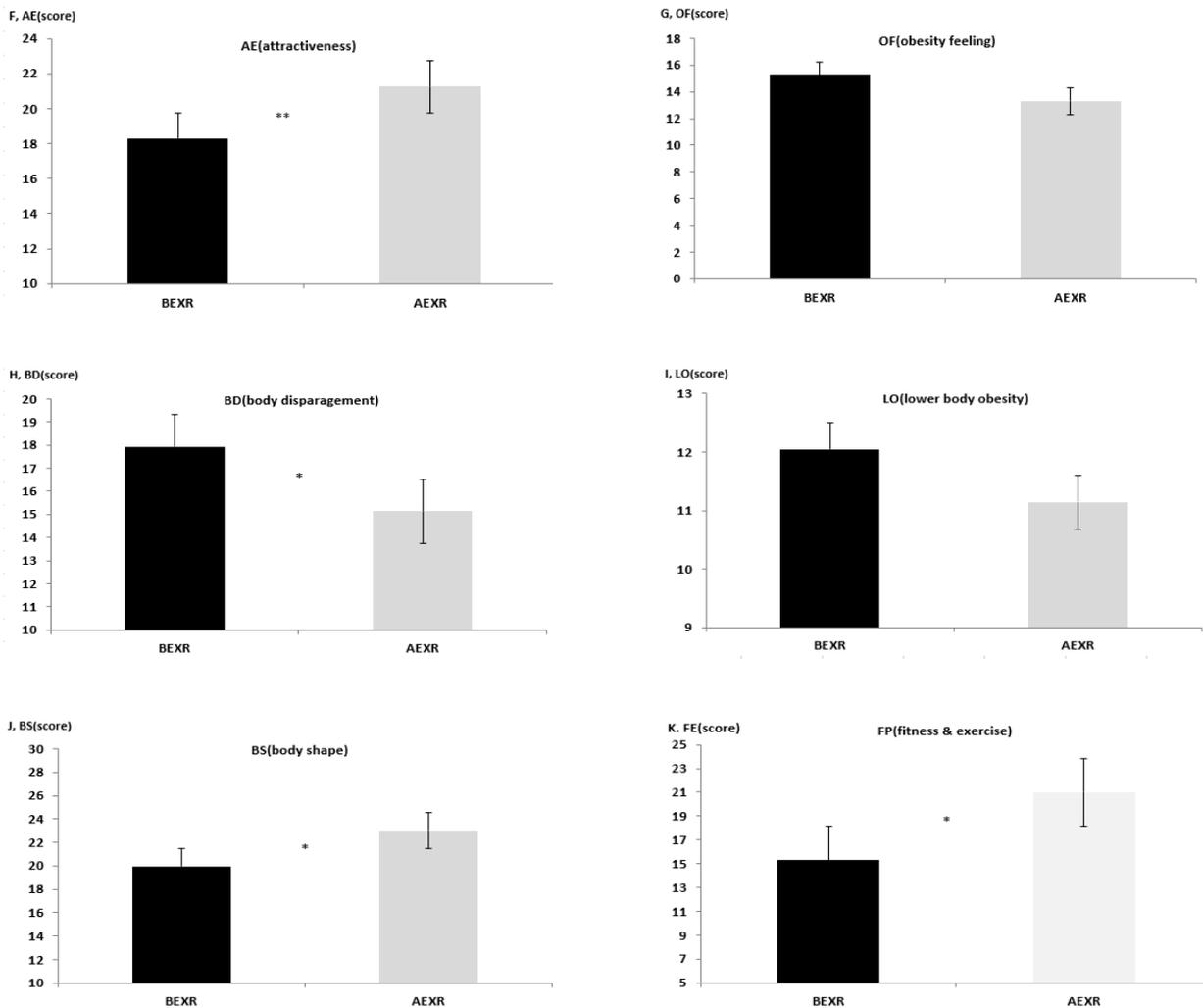


Figure 2. Dependent Variables2 according to complex treatment exercise

Values are means ± SEM. *,**Significant different among groups($p < .05$, $p < .01$), F; body attractiveness, G; feeling obesity, H; body disparagement, I, lower body obesity, J; salience of weight and shape, K; fitness & physical activity, BEXR; before exercise, AEXR; after exercise.

And, a suggested in table1, it has significant relationship that skeletal muscle mass, basal metabolism, and body image factors (body attractiveness, fitness & physical activity, importance of body shape) after participation in Pilates and Yoga complex treatment exercise are relating to normal correlation, and basal metabolism and body image factors (body attractiveness, fitness & physical activity, and the importance of body shape) are relating to normal correlation as well. Meanwhile, the correlation between muscle mass and physical image factors (feeling of obesity, obesity of the lower body, body disparagement) showed significant inverse correlation. And, the relationship between basic metabolic rate and body image factors was negative significant ($p < .05$, $p < .01$).

Table 1. Correlation Coefficient between related factors after complex treatment exercise

| | WE | FM | %fat | SMS | BMR | AE | OF | BD | LO | BS | FP |
|------|---------|--------|--------|---------|--------|--------|------|----|----|----|----|
| WE | 1.00 | | | | | | | | | | |
| FM | .914** | 1.00 | | | | | | | | | |
| %fat | .806** | .939** | 1.00 | | | | | | | | |
| SMS | -.615** | -.530* | -.433* | 1.00 | | | | | | | |
| BMR | -.535* | -.469* | -.417* | .694* | 1.00 | | | | | | |
| AE | -.864** | -.732* | -.634* | .547* | .525* | 1.00 | | | | | |
| OF | .471* | .325 | .480 | -.512** | -.530* | -.427* | 1.00 | | | | |

| | | | | | | | | | | | |
|----|-------|--------|-------|--------|--------|---------|-------|---------|-------|--------|------|
| BD | .523* | .616** | .511* | -.601* | -.568* | -.531** | .420* | 1.00 | | | |
| LO | .531* | .416* | .520* | -.506* | -.409* | -.559* | .6388 | .459* | 1.00 | | |
| BS | .493* | .501* | .487* | .625** | .596* | .602** | .525* | .627** | .473* | 1.00 | |
| FP | .523* | .616** | .511* | -.601* | -.568* | -.531** | .420* | -.541** | .425* | .879** | 1.00 |

* p<.05, **p<.01, WE; weight, FM; body fat mass, %fat; body percentage fat, SMS: skeletal muscle mass, BMR; basal metabolic rate, AE; body attractiveness, OF; feeling obesity, BD; body disparagement, LO; lower body obesity, BS; salience of weight and shape, FP; fitness & physical activity

Modern society is full of unrealistic expectations about the body due to socio-cultural influences. In an appearance-oriented society worldwide and the social trend that skinny body is most favored body image, as more and more people are not satisfied with their body and a number of social problems are being created, attention and counter measure should be needed.

Uchoa et al.[1] said that, mass-media has a great influence on forming concept of body beauty among teenagers in modern society. Sometimes, women's efforts to maintain and develop for positive-body image are facing a lot of pressure in terms of socio-cultural aspect that often creates confusion. Negative image of body for oneself is closely related to low social self-esteem and high social anxiety, and it is likely to cause social pathologies such as loss of self-esteem, human alienation, depression, anxiety, stress, and social isolation for young women due to dissatisfaction with the body. In particular, young people's interest in the body image is very high as body maturity is completed, and the body image formed at this time has a great influence over the entire life[9].

Body image can be changed by various factors throughout life, and physical activity has the most positive effect on body. It has been reported that an active elderly person is more satisfied with his body appearance and actively participates in everyday life than an inactive elderly person[10].

It also has been reported that scientific exercise program improves satisfaction with body image and prolonged participation in exercise reduces body dissatisfaction with changes in body composition[3]. Ramos et al.[11] said that it is necessary for college students to practice healthy eating habit and exercise regularly to increase satisfaction with their body image.

In general, it is consistently reported that regular exercise habit has a positive effect on health-related fitness, cardio-respiratory system, musculoskeletal system, anxiety, nervousness, depression, stress, social phobia, self-esteem, social development, and self-satisfaction. Particularly, Pilates and Yoga have positive effects on both mental and physical aspect, and the number of participant is increasing as it is recognized as an effective exercise for body shape and posture correction by strengthening the spine and joints without causing pain[12].

Erdoğan-Yüce et al.[13] said that physical activities such as yoga are effective in reducing anxiety, depression, and stress of young women. Dunleavy et al.[3] also reported positive changes in the body of women who participated in Yoga program. Particularly, Dianne et al.[14] reported that Yoga and Pilates have a positive effect on body dissatisfaction after practicing 30 minutes or more once a week for early adult age group.

In this study, satisfaction with body image showed positive results in all 24 items in 6 areas after participating in Pilates and Yoga complex exercise. These results showed a tendency coinciding with previous studies that Pilates and Yoga programs had a significant effect on physical image and mental health as well. As described above, the effect of improving the physical image after participation in Pilates and Yoga complex exercise is thought to have affected the stability of the mind as well as on the body composition delivering continuous stimulation to the core muscles.

Reduction of muscle mass and energy consumption of human body due to lack of physical activity and irregular eating habit is known to be a major cause of metabolic syndrome. Particularly, decrease in muscle mass or muscle strength emerges as a critical problem because it is related with a decline in bodily functions and high mortality as well.

Muscle mass is the largest component of body composition and it is closely related to energy metabolism, osteoporosis and fractures. It is known that the muscle mass and size of each part and whole body varies depending on gender and age, and decrease rapidly with age. In particular, decreasing of muscle mass causes functional problems in terms of muscle strength, walking speed, and the sense of balance, which result in muscle atrophy and reduced physiological reserve that can bring about a lot of trouble in everyday life[15].

Leeners et al.[16] stated that people who have normal weight but perceive it as overweight due to body dissatisfaction show a decrease in muscle mass and muscular dystrophy because they try to lose weight mainly through controlling of dietary intake. Such a decrease in muscle mass has possibility of high body fat percentage bringing about a decrease in basal metabolism. If such bad habit lasts for a long time, the risk of various metabolic diseases can be very high due to negative changes in hormones following age increase and menopause. Therefore, they said that it was important to assess and manage the level of basal metabolism from 20s.

Basal metabolism is the minimum energy consumed by body organs to maintain the life, accounting for 60-70% of daily energy consumption. This basal metabolism is influenced by various factors such as age, gender, weight, LBM, muscle mass, fat mass, exercise rate, body temperature, hormones, and menstrual cycle. Further to this, because its ratio of daily energy

consumption is very high, physical activity is considered to be an important factor while people who have larger muscle mass show higher basal metabolism[17].

It is recommended for inactive people to participate in a gradual exercise program that enables to increase muscle mass because muscle loss appears earlier compared to active people and causes pain and various diseases. Robert[18] reported that exercise makes it possible not only to lose weight on the back of substantial reduction in body fat and increase in basal metabolism and muscle mass as well, but also to positively affect psychological factors to control appetite and reduce weight.

After participating in Pilates which strengthens the central muscles of the body, positive variation of body composition such as increased muscle mass and decreased %fat have been reported. Particularly, Divya et al.[19] reported a decrease in heart rate, blood pressure, increase in lung capacity, decrease in body mass index, increase in muscle mass, increase in thyroid function, and decrease in cholesterol in young age group participating in Yoga exercise. Also, Homsby & Johnston[20] said the quality of life, muscle strength, instant reaction, and reaction speed as well as the increase in basal metabolism in children and younger age group were improved after Pilates exercise.

This study also showed an increase in muscle mass and basal metabolism after participation in Pilates and Yoga combined exercise, consistent with previous studies. These results showed that the complex movements of Pilates and Yoga over a long period of 12 weeks acted as a physical load on the skeletal muscle with minimal effective stress on the skeletal muscle, and it is regarded that these complex movements gave enough stimuli for neuromuscular activation and brought positive changes.

4. Conclusion

As described above, it was confirmed that the complex treatment exercise program of Pilates and Yoga is effective to form a correct body image, positively affecting the muscle mass and basal metabolism of young women. Therefore, it is important to have a positive awareness of one's body participating in regular physical activities for continuous health care. Further study, however, may provide more accurate information if change trend depending on comparative analysis with different type exercise, sex, intensity of exercise, and change of exercise period is made.

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6. References

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