

Psychological benefits of bench-step aerobics program in overweight or obese adult women: its effects on anger, exercise self-efficacy, exercise-related affect, and body image

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I. Introduction

The incidence of overweight and obesity in Korea has reached the epidemic proportions; according to a recent survey, more than 30% of Korean adult population is obese (Ministry of Health and Welfare, MOHW, 2006). Overweight as well as obesity play an important role in the growing burden of chronic diseases in that cardiovascular disease, diabetes, some cancers, etc. are adverse consequences of overweight and obesity. Together, this calls

for a clear need for promoting exercise which has been reported to reduce the risk for these complications of overweight and obesity.

One of the strategies for promoting exercise participation is to disseminate evidence-based best exercise programs. These best exercise programs are programs which are nicely balanced between efficacy, safety, and feasibility and confirming these three components should be preceded to disseminating a certain exercise program. Safety and feasibility components, in particular,

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should be considered more importantly when programming exercise programs for overweight/obese individuals as these subjects are at relatively higher risk for developing cardiovascular and musculoskeletal disease and tend to be more reluctant to exercise when compared with their non-overweight/obese counterparts.

In line with this strategy, some researchers have reviewed and examined bench-step aerobics (BSA)'s efficacy, safety, and feasibility in overweight/obese Korean women (Kim et al., 2006; Ko and Park, 1997). In these studies, BSA appeared to be a safe exercise modality for overweight/obese Korean women. Also very important in the advantages of BSA is its high feasibility. Its feasibility is higher than even walking, which has been known to be highly feasible, thereby having been disseminated nationwide along with the "Health Plan 2010". Compared to BSA, walking has a lot more limitations; walking needs a certain spacious place, is affected by some climacteric factors, and is likely to expose overweight/obese individuals to their non-overweight/obese counterparts who are likely to have negative feelings about overweight/obesity.

Regarding the efficacy of BSA, however, despite BSA's substantial impact on cardiorespiratory fitness, blood pressure, lipid profiles, muscular strength, and balance (Christman et al., 1998; Ko and Park, 1997;

Kraemer et al., 2001; Yukari et al., 2005), little has been reported (no studies, to our knowledge) concerning its psychological benefits. Collectively, previous studies show a clear need for investigating BSA's psychological benefits.

Among psychological benefits attainable from exercise (Fox, 2000; Netz et al., 2005; Penedo and Dahn, 2005), some psychological benefits appear to be more valuable than others, particularly in overweight/obese adult women, when achieved. These are psychological benefits related to anger, exercise-related affect, exercise self-efficacy, and body image. The rationale of this notion is as follows. First, it has been reported that some Korean women suffer from anger (eg, anger-related health problems possibly caused by suppressed anger) especially when they reach mid-life and this anger has been suggested as associated with the development of cardiovascular disease (Haynes et al, 1980; Rääkkönen et al., 1999, 2004; Wattanakit, 2005; Williams et al., 2000). Second, given that almost all studies report a decline in exercise adherence over time (Klein et al., 2004) and about 50% of individuals who start an exercise program drop out within 6 months (Dishman, 1994), psychological benefits strongly related to exercise adherence, such as exercise self-efficacy and exercise-related affect (McAuley et al., 1994), are of crucial

importance. Third, body image, which tends to be disturbed in individuals with excess body weight, has been shown to be associated with decreased levels of self-esteem and elevated depression, to mediate the relationship between obesity and psychological distress (Friedman et al., 2002), and to be one of the barriers to exercise participation (Jones, 2003).

As such, this study was performed to investigate whether BSA has beneficial effects on anger, exercise self-efficacy, exercise-related affect, and body image in overweight/obese Korean women to give support to BSA's efficacy.

II. Methodology

1. Subjects

Subjects of this study were selected among public health center visitors and those recruited by putting an advertisement in local newspapers and the public health center homepage. Subjects for the control group were recruited separately from those for the exercise group. So they were not randomly assigned and this study was not a randomized controlled trial. Both groups completed a questionnaire packet before and after the BSA program (from August to November in 2006) at the public centers separately. A consent to participate in this program was

given by the subjects.

Subjects of the exercise group were sedentary overweight ($23 \leq \text{BMI} < 25$) or obese ($\text{BMI} \geq 25$) (WPRO, IASO, & IOFT, 2000), have no evidence of participation in a structured exercise program during the 6 months prior to this study participation, and have no contra-indications for exercise participation (ACSM, 2006). Subjects who showed abnormal physiologic responses (ACSM, 2006) during the initial screening test including 1 mile walking test were excluded. They participated in a BSA program held in two public health centers located in Gyeonggi Province. Subjects for the control group were sedentary overweight or obese women and they were told not to change their physical activity habit during the first data collection at the public health center and demonstrated no changes in their physical activity habit across the intervention period when they visited for the second data collection.

Initially 22 women started the BSA program, however, 7 women dropped out or did not completed the second data collection completely. In the control group, of 16 women who agreed and completed the first data collection, 3 women did not completed the second data collection completely. Therefore, data from 15 women in the exercise group and 13 women in the control group were analysed.

Table 1. Demographic information and homogeneity test of subjects

Characteristics	Exercise group(n=15)	Control group(n=13)	t	p
	M (SD)	M (SD)		
Age (year)	47.20 (7.62)	45.23 (10.01)	.590	.560
Height (cm)	155.60 (3.88)	156.81 (5.43)	-.688	.498
Weight (kg)	68.12 (7.84)	64.46 (8.31)	1.196	.242
Body mass index (kg/m ²)	28.13 (3.16)	26.13 (2.21)	1.907	.068
Anger	1.34 (0.41)	1.28 (0.45)	.337	.739
Exercise self-efficacy	6.28 (1.10)	5.56 (2.11)	1.096	.288
Exercise-related affect	5.38 (1.70)	4.83 (1.93)	.767	.450
Body image	2.45 (0.42)	2.68 (0.39)	-1.485	.150

M, mean; SD, standard deviation

Demographics of the subjects are presented in Table 1.

2. Intervention

Initially, the exercise program consisted of 45 minutes of BSA prescribed at an intensity of 40/50% (40% for women who experienced menopause and 50% for premenopausal women) of individual heart rate reserve (HRR) and a frequency of 3 days a week. As the subjects' tolerance for the exercise program improved, the duration of exercise was increased to 55 to 60 minutes and the intensity to 50/60% HRR gradually.

Although higher exercise amount, even double the amount of currently recommended minimum physical activity amount (at least 30 minutes of moderate intensity physical activity on 5 days of the week; 150 minutes of moderate intensity physical exercise), is recommended for weight control (IOM, 2002), exercise for obese people should be more safe

and individual differences are suggested in weight control effects of exercise (Saris et al., 2003). Thus, exercise amount comparable with the current minimum exercise recommendation associated with health benefits (US Dept. of Health and Human Service, 1996) were applied in this study. Moderate intensity was chosen because this exercise intensity is preferred for the favorable psychological effects as well as the safety of an exercise program (Netz et al., 2005).

The program was proceeded from August to November in 2006. This program was guided by a training instructor informed by an certified exercise specialist who was one of the researchers of this study. Although different instructors were allocated to each public health center, we assume that there were no significant differences in the program because the content of the program was the same and each instructor was informed by the same exercise specialist.

3. Measurement

1) Trait anger

Trait anger was assessed using the well-validated Trait Anxiety Inventory (Jeon et al., 1997). The number of items was 10 and each rated on a four-point Likert scale ranging from one (definitely untrue) to four (definitely true). Cronbach's reliability coefficient was .919 in this study.

2) Exercise self-efficacy

Exercise self-efficacy was assessed by the Exercise Self-efficacy Inventory which was developed based on Sallis et al. (1986)'s measurement (Lee, 2001). This measurement consists of 12 items assessing self-efficacy towards exercise participation in the face of barriers. Scores were originally from 10 (have no confidence) to 100 (completely confident) but converted to one (have no confidence) to ten (completely confident) for analysis. Cronbach's reliability coefficient was .915 in this study.

3) Exercise-related affect

This measurement was designed to assess emotional reaction (Triandis, 1977) in response to thinking of exercise. This consists of a set of three bi-polar adjectives (pleasant-unpleasant, interesting-boring, not fun-fun) (Godin, 1987). Responses were made on a 7-point Likert scale (eg, 7 when completely pleasant and 1 when completely

unpleasant). Cronbach's reliability coefficient was .981 in this study.

4) Body image

Body image was assessed using the Ryu (2005)'s measurement. This measurement consists of 14 items (5-point Likert scale, ranging from 1 (completely dissatisfied) to 5 (completely satisfied)) assessing individuals' satisfaction with their body parts and general external appearance. Cronbach's reliability coefficient was .755 in this study.

4. Statistical analysis

Statistical analyses were performed using the SPSS WIN 12.0 program. Pre- and post-intervention values were compared using paired *t*-tests. The changes in the psychological variables of the exercise and control groups were compared using independent *t*-tests. Findings were considered statistically significant at $P < 0.05$.

III. Results and Discussion

1. Results

1) Demographic characteristics

Characteristics of the participants are presented in Table 1. Independent *t*-tests revealed no significant differences between the exercise and control groups in subjects' height, body weight, body mass index, and

Table 2. Changes in anger, exercise self-efficacy, exercise-related affect, and body image in the exercise group

	Pre-training M (SD)	Post-training M (SD)	t	p
Anger	1.34 (0.41)	1.19 (0.24)	1.661	.119
Exercise self-efficacy	6.28 (1.10)	6.31 (1.44)	-.039	.970
Exercise-related affect	5.38 (1.70)	5.66 (1.32)	-1.039	.321
Body image	2.45 (0.42)	2.79 (0.38)	-3.521	.003**

M, mean; SD, standard deviation

study variables (ie, anger, exercise self-efficacy, exercise-related affect, and body image <Table 1>.

2) Effects of a step exercise program on anger, exercise self-efficacy, exercise-related affect, and body image

Paired *t*-tests revealed a decrease in anger and increases in exercise self-efficacy and exercise-related affect after the BSA program but there were no significant changes. Body image score in the step exercise group was increased and this increase reached statistical significance <Table 2>. Significant unfavorable changes were found in the level of exercise

self-efficacy in the control group <Table 3>. Significant differences were found in the changes of anger between the exercise and control groups. The changes of the scores in anger, exercise self-efficacy, and exercise-related affect, however, were not significantly between the two groups <Table 4>.

2. Discussion

Participants' anger was favorably changed after the 12-wk step exercise program in this study. However, there was no statistical significance. Possible explanations for this absence of significant exercise effects on anger in this study may include the

Table 3. Changes in anger, exercise self-efficacy, exercise-related affect, and body image in the control group

	Pre-training M (SD)	Post-training M (SD)	t	p
Anger	1.28 (0.45)	1.33 (0.57)	-.428	.676
Exercise self-efficacy	5.56 (2.11)	4.62 (1.59)	2.866	.014*
Exercise-related affect	4.83 (1.93)	5.11 (2.23)	-.511	.620
Body image	2.68 (0.39)	2.47 (0.59)	.197	.072

M, mean; SD, standard deviation

Table 4. Comparison of the changes in anger, exercise self-efficacy, exercise-related affect, and body image between the exercise and control groups

	Exercise group M (SD)	Control group M (SD)	t	p
Anger	.14 (0.33)	-.05 (0.45)	1.326	.196
Exercise self-efficacy	-.01 (1.72)	.93 (1.17)	-1.663	.109
Exercise-related affect	-.50 (1.66)	-.27 (1.88)	-0.306	.763
Body image	-.33 (0.36)	.20 (0.38)	-3.833	.001**

M, mean; SD, standard deviation

following. First, there may have been a floor effect. Despite the demographic characteristics of this study population (ie, middle-aged women who are likely to have anger-related health problems possibly caused by suppressed anger), the subjects' level of anger was quite low (Mean=1.34), which leads to the absence of significant effects (ie, a floor effect). At the beginning, we anticipated that participants' anger levels would be high to the extent that exercise would result in a positive effect as middle-aged women is a population in which elevated anger levels are likely to be found (Lee, 2002). However, the actual levels of anger were quite low contrary to our expectation.

Second, this result may have resulted from the insensitive nature of the measure used in this study. Most instruments assessing negative mood states like anger are designed for use in clinical populations (Netz et al., 2005). Accordingly, it is possible that the measure was not sensitive enough to pick

up small changes in anger.

Third, the participants' inaccurate or dishonest response to the questionnaire may have led this result. Traditionally, expressing anger has often been regarded as inappropriate or unacceptable in Korea and this was especially true for women. Furthermore, suppressing or repressing negative feelings, such as anger, has been regarded as a virtue. In this social context which encourages women to suppress their anger, women would not always be honest or accurate in their responses to questionnaires measuring the level of anger. This may have led the subjects to report their anger as low consciously or unconsciously, leading to the failure to show significant exercise effects on anger in the present study.

Conceivably, exercise can be an excellent avenue to express anger constructively, thereby reducing the amount of angry feelings. Although the mechanisms underlying the relationship between exercise and anger

is not clearly understood, it has been suggested that exercise may simply reduce the amount of angry feelings or, alternatively, people who normally suppress anger tend to increase their exercise frequently and reduce anger-in (Buchman et al., 1991; Hassmen et al., 2000). In accordance with this, there also have been empirical evidence implying exercise shift individuals from more to less inclined to suppress their anger (Buchman et al., 1991; Hassmen et al., 2000).

Therefore, further studies which apply more sensitive measure and involve women with relatively high levels of anger are required to explicate the anger-lowering effect of exercise training in middle-aged Korean women.

In the present study, the level of subjects' exercise self-efficacy increased after exercise training but the changes did not reach statistical significance. This result is consistent, in part, with the findings of previous studies conducted across varying populations (Lee and Jang, 2001; Seo, 2003). In some of those previous studies, exercise self-efficacy even decreased after interventions which aimed to promote physical activity (Edmunds et al., 2007; Speck and Looney, 2001). One plausible explanation for this result would be the difference between presumption and reality. That is, before engaging in an exercise program, individuals' exercise self-efficacy may not be realistic but

it is likely to become more realistic as individuals begin a behavior and are presented with actual barriers and become to know how difficult it is to overcome those barriers (Speck and Looney, 2001).

Given this, integrating additional interventions such as behavior change theory-based (eg, self-efficacy theory, trans-theoretical model) interventions or counseling (eg, counseling involving helping participants elaborate strategies to stick with their exercise programs when faced with vulnerable situations, such as social obligations, holiday celebrations, and stressful life changes) into an exercise program appear to be necessary to strengthen self-efficacy expectations (Dallow and Anderson, 2003).

With limited number of studies especially in the sample of overweight/obese women, however, the effect of exercise only intervention on exercise self-efficacy is unclear. This leaves a clear need for further research.

In our study, BSA program increased subjects' level of exercise-related affect. During exercise, certain chemicals in the brain, such as endorphins, adrenaline, serotonin, and dopamine, are expected to be raised, making it plausible to think of a positive effect on exercise-related affect.

However, only a small statistically insignificant increase of exercise-related affect was seen in the present study. This

finding was inconsistent with a few theories which have been suggesting that exercise-related affect increases after exercise training (Bandura, 1986; Pender, 1996). One possible explanation for this finding may be the dose-response relationship between physical exercise and mental health. In this study, participants exercised at a moderate intensity as a meta-analysis (Netz et al., 2005) showed the moderate-intensity exercise's effects on psychological health benefits. However, there has been a notion that chemicals mentioned above may increase substantially only after a certain intensity of exercise, which is higher than the intensity applied in this study (Leuenberger, 2006). Therefore, further studies investigating the effects of various intensity exercises on exercise-related affect need to be done.

In the mean time, there is possibility that this finding resulted from a relatively high initial level of exercise-related affect in this study population (ie, a ceiling effect). We recruited women who wanted to participate in a 12-wk exercise program. This may have led to the relatively high levels of exercise-related affect as individuals who seek exercise programs are likely to have high levels of exercise-related affect.

The findings from previous studies support, in part, this ceiling effect by showing that the effect of exercise on exercise-related affect was significant when

the initial levels of it was relatively low (Kim, 1994) while that effect was not significant in individuals with relatively high initial levels of exercise-related affect (Lee, 2004). Thus, studies examining the effect of BSA on exercise-related affect in individuals who have relatively low initial levels of exercise-related affect are required.

However, the possibility that program itself was rather boring might be another reason for the absence of exercise-related affect-enhancing effect in this study. Although encouraging them to talk to each other was one of the applied strategies to decrease boredom in this study, more effective strategies enhancing enjoyment (eg, providing televisions or music) were not included. Providing televisions was not available. In addition, we deliberately did not allow participants to listen to some music as music makes it difficult for the participants to maintain the individually prescribed exercise intensity (% HRR) because of its tempo. So, it is likely that these factors were responsible for the possibly rather boring exercise environment, which, in turn, resulted in statistically insignificant effects on exercise-related affect. Therefore, there is a need for studies investigating the effect of BSA programs in which watching television or listening their favorite music is available. If combined with such sufficient audio-visual flow, even repetitive, monotonous movements

(step-up and step-down) of BSA program may result in more positive exercise-related affect.

Body image improved significantly after a 12-week BSA program. This result is in accordance with the result of a meta-analysis (Netz et al., 2005). Though the mechanism behind this effect remains unclear, one plausible explanation for this will be the notion that exercise is associated with the decreased body size, body weight, and body fat in turn enhanced self-image. Additionally, moving their standards by seeing people with similar body shape could be another reason for them to have a more positive body image.

This body image-improving effect suggests that BSA is of crucial importance in the management of overweight/obese individuals. The reasons are as follows. First, this effect is of crucial importance in the management of overweight/obese individuals by facilitating exercise initiation and maintenance. It is known that overweight/obese individuals are likely to have negative body image and this negative body image could be an avenue to promoting weight control (Riley et al., 1998) on one hand. However, this negative body image can make this population shrink from exercising outside their houses on the other hand. Therefore, this body image-enhancing effect of BSA is of importance also in facilitating the initiation and maintenance of exercise behavior.

Second, this effect is of crucial importance in the management of overweight/obese individuals as it helps prevent psychological complications of overweight/obesity. It has been suggested that the negative body image, which is often found in overweight/obese individuals, may lead to disordered eating (eg, binge eating), low self-esteem, and depression (Edman et al., 2005; Sarwer et al., 1998). Together, this implies BSA can prevent psychological problems such as disordered eating, low self-esteem, and depression in overweight/obese Korean women.

IV. Conclusion and suggestions

With the emerging public health problem of obesity nationwide, disseminating best exercise programs, which are nicely balanced between efficacy, safety, and feasibility, is of critical importance. As described earlier, BSA has been suggested to be effective as well as safe and feasible in overweight/obese individuals but its efficacy in terms of psychological benefits has received little attention, leaving its psychological benefits unclear. Adding to the empirical evidence for its cardiovascular risk-reducing effects in overweight/obese Korean women (Ko and Park, 1997), our study demonstrated, in part, psychological benefits of BSA.

Its psychological benefits, however, were supported only partially in this study. With this partial support and almost no related previous studies, there could be doubt on the psychological benefits of BSA. So, there is a clear need for further studies. First, studies with a large sample size are warranted; although there have not been enough empirical studies to support this notion, the sample size of this study might have been too small to lead to significant effects on psychological variables investigated in this study. Second, since a ceiling effect or a floor effect was found to be a possible reason of lack of significant effects, studies involving women whose levels of anger are relatively high or whose levels of exercise-related affect are relatively low are required. Third, there also is a need for studies investigating the exercise-related affect-enhancing effect of BSA combined with enjoyment-enhancing strategies (ie, watching television or listening to individuals' favorite music on condition that its tempo corresponds to individually determined exercise intensity). Lastly, the demographic characteristic of this study sample, mainly middle-aged women, might have led the BSA program to fail in showing significant psychological benefits. It is well-known that mid-life tends to cause a psychologically depressed status in women. So, there is quite a possibility that this

psychologically depressed status could have deterred subjects in the exercise group from attaining substantial psychological benefits of BSA. As such, studies involving other age groups are recommended.

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ABSTRACT

Objectives: The efficacy, feasibility, and safety of bench-step aerobics (BSA) program in overweight or obese Korean adult women have been implied. However, there has been almost no evidence for its psychological benefits. As such, the purpose of this study was to investigate the psychological benefits of BSA program in overweight or obese (body mass index ≥ 23 kg/m²) Korean adult women. **Method:** Anger, exercise self-efficacy, exercise-related affect, and body image of overweight or obese women who participated in a 12-week BSA program (n=15) were compared with those of their counterparts in the control group (n=13). Subjects were selected among public health center visitors and those recruited by putting an advertisement in local newspapers and the public health center homepage. Data from the exercise and control groups were collected before and after the 12-week BSA program (from August to November in 2006) at the public health centers. The exercise program consisted of 45 to 60 min moderate-intensity (40/50 to 50/60% of their hear rate reserve) BSA performed for 3 days a week. **Results:** After the BSA program, body image of the subjects in the exercise group was significantly improved and there was a significant difference between the exercise and control groups. Anger, exercise self-efficacy, and exercise-related affect were improved after the BSA program but the changes did not reach the level of statistical significance and there were no significant differences between the exercise and control groups. **Conclusions:** In conclusion, BSA appears to significantly enhance body image in overweight or obese Korean adult women but its effects on anger, exercise self-efficacy, and exercise-related affect do not appear to be statistically significant. Further studies involving different subjects, particularly whose levels of anger are high or whose levels of exercise-related affect are low to exclude the influence of the ceiling or floor effect, are warranted in a randomized controlled design.

Key Words: exercise, bench-step, psychological benefits, women

<국문초록>

과체중 및 비만 성인 여성 대상 스텝운동 프로그램의 심리적 효과: 분노, 운동관련 자기 효능감, 운동관련 정서 및 신체상에 미치는 효과

스텝운동(bench-step aerobics: BSA)이 과체중 및 비만 우리나라 성인 여성을 위한 효과성, 안전성 및 실행 가능성을 갖춘 운동 프로그램이라는 것이 다수 연구자들에 의해 시사되어 왔다. 그러나 그 효과성은 일부 생리적 효과에 한하여 검증되었을 뿐 심리적 효과에 대해서는 거의 연구되지 않았다. 따라서 본 연구는 스텝운동 프로그램이 우리나라 과체중 및 비만(체질량지수 $\geq 23 \text{ kg/m}^2$) 성인 여성에게 미치는 심리적 효과를 알아보기 위해 수행되었다. 이러한 목적을 달성하기 위해 보건소 방문자와 지역신문 및 보건소 홈페이지 홍보를 통해 모집된 여성 중 편의 추출한 운동군 15명과 대조군 13명의 분노(anger), 운동관련 자기 효능감(exercise self-efficacy), 운동관련 정서(exercise-related affect), 그리고 신체상(body image)을 운동 프로그램 전후에 측정하여 비교하였다. 자료 수집은 12주 스텝운동 프로그램(2006년 8월~11월) 전과 후에 보건소에서 이루어졌다. 운동군에게 적용된 스텝운동 프로그램은 중강도 [개인의 예비 심박 수(Heart Rate Reserve : HRR)의 40/50~50/60%] 로 45~60분 동안 주 3회 이루어졌으며, 상기 운동 강도 및 운동 시간은 대상자의 적응도에 따라 12주에 걸쳐 점진적으로 증가되었다. 12주간의 스텝운동 후 운동군의 신체상이 유의하게 개선되었으며, 이는 대조군에서의 변화와도 유의한 차이를 보였다. 분노, 운동관련 자기 효능감, 그리고 운동관련 정서 또한 개선되는 경향이었으나 통계적으로 유의한 변화는 보이지 않았다. 이로써 우리나라 과체중 및 비만 성인 여성 대상 스텝운동의 심리적 효과가 부분적으로 지지되고 있으나, 현재까지 이루어진 관련 연구가 거의 없고 본 연구 또한 연구 설계상의 제한점을 갖고 있으므로 연구결과의 일반화를 위한 추후 연구가 요구된다. 특히 Floor effect 및 Ceiling effect 등에 의한 효과를 배제하기 위해 분노 수준이 상대적으로 더욱 높거나 운동관련 정서 수준이 상대적으로 낮은 과체중 및 비만여성을 대상으로 반복 연구를 수행할 필요가 있다.

주제어: 벤치-스텝운동, 심리적 효과, 여성