The effects of empowered motivation on exercise adherence and physical fitness in college women

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The purpose of this study is to identify the effects of exercise adherence when exercise motivation was empowered. It was planned as a pretest-posttest nonequivalent quasi-experimental design. The study subjects were female college students who wanted exercise and agreed to participate in the Jane Fonda Workout Program (1982) for a period of six months. The subject sample was divided into an experimental group and a control group by college department to prevent contamination of the intervention, which promotes long-term exercise-program adherence through the EMPOWER Step Program. All subjects’ body composition and physical fitness were measured using the Inbody (520) Body Composition Analyzer and Helmas (Korea) measuring equipment. Cronbach’s α, t-test, odds ratio and analysis of covariance were used to analyze the data using the Statistical Package for the Social Sciences program. According to the results the experimental group showed a 66.66% exercise adherence success rate and the control group showed only a 26.31% success rate (OR = 5.60, \( P = 0.01 \); \( t = 2.932, P = 0.006 \)). Skeletal muscle mass was significantly higher in the experimental group than in the control group (\( F = 8.45, P = 0.006 \)). Body fat mass decreased significantly more in the experimental group than in the control group (\( F = 6.08, P = 0.01 \)). Empowered motivation has positive effects on adherence to exercise regimes and physical fitness in female college students. Therefore it is suggested to actively utilize the EMPOWER Step Program to foster long-term exercise.

Keywords: Empower, Motivation, Exercise adherence, Physical fitness, College women

INTRODUCTION

Physical strength peaks in one’s twenties and drops sharply in one’s thirties. Therefore the physical strength and health condition in one’s twenties has a deep impact on health throughout the remaining lifespan, let alone that in the thirties and forties (An et al., 2009). Due to physiological processes unique to women such as menstruation, pregnancy and the menopause, women suffer greater deterioration of physical strength with advancing age (Jee et al., 2004; Son and Choi, 2005). Considering that young women pave the way for the next generation’s health, regular exercise is needed to improve young women’s physical strength. Amongst the various age and gender groups amongst adults aged over 19 in the Republic of Korea, the rate of physical exercise is the lowest in women in their twenties, at less than 15% (Chang and Jung, 2000; Kim, 2006). Also their health care state receives little attention in the legal and regulative systems (Yi et al., 2004).

Although people recognize that exercise is beneficial to health, about 50% of those who start exercising cease within three to six months, before the beneficial effects of exercise come in. This reveals that people have trouble in exercising steadily over a sustained period (Dishman, 2001; Kim, 2006, 2007). To fix this problem, practical guidelines and principles based on various knowledge should be applied to any exercise action plan (Yoo, 2003, 2007).

Motivation is the key factor in maintaining steady exercise; starting, setting a course, and predicting steadfast implementation (Kilpatrick et al., 2005; Song et al., 2006, 2007; Taylor and...
Wilson, 2005). Motivation to exercise varies individually for diverse reasons, and shifts meta-motivational states corresponding to circumstance and situation, eventually leading to the exercise cessation (Choi and Moon, 1999; Keele-Smith and Leon, 2003). One needs at least six months of steady exercise to acquire the joy of doing exercise, which is the core factor in enabling one to sustain their exercise over a long period.

The development of a motivational enhancement education program, which helps student to learn by fulfilling step-by-step goals, is required for the purpose of enhancing motivation to partake in regular sustained exercise (Bulechek and McCloskey, 1999; Keele-Smith and Leon, 2003; Seo, 1998). Seo (1998) suggested education motivation, the application of effective education principles, promotion of personal relationships and mutual communication, and the use of a patient action contract as guidelines for enjoyable exercise. Jung (2000) reported that one is more likely to exercise persistently, experiencing more positive emotions when he or she chooses an appropriate exercise for himself/herself. Kang (2001) emphasized that setting step-by-step goals and gaining satisfaction from fulfilling them motivates one to exercise consistently. Lee (2000, 2004) suggested that interventions which enhance individual attitudes towards exercise and control behaviors and individual perceptions about exercise are required. She also proposed that it is more effective to focus on individual’s conviction and exercise experience as motivational factors for steady sustained exercise, to promote the exercise intent, fostering a more positive feeling of exercise.

Cho and Song (2003) reassured that behavioral and conceptual change processes, self efficiency, and balanced decision making are essential factors affecting transition steps of exercise behavior among college students. Individual feedback and motivation empowerment programs are effective for reducing seniors’ body fat. In formulating an exercise intervention strategy for middle-aged women’s exercise promotion and adherence, individual motivation levels should be considered for increasing change. They also emphasized that the strategy should include something which fortifies self-efficacy for efficiency of the intervention.

Meta-analysis of factors related to women’s adherence to sustained exercise programs indicated that the most important factors in women’s physical activity are enjoyment and self efficiency. Studies also emphasized that self efficiency formation utilizing exemplary social modeling and verbal persuasion is useful for promoting a regular physical activity regime over a long period (Brassington et al., 2002; McAuley et al., 2003; White et al., 2005).

MATERIALS AND METHODS

The purpose of this study is to identify the effects of empowered motivation on exercise adherence. This study was planned as a pre-test-posttest nonequivalent quasi-experimental design (Table 1).

The study subjects were 45 female students attending a university-college, located in ‘G’ city, who wanted exercise and agreed to participate in the Jane Fonda Workout Program after reviewing the purpose of the study and seeing video clips of the exercises. The sample was divided into an experimental group (n = 21) and a control group (n = 24) by college department to prevent contamination of the intervention. Eight subjects (four from the control group, four from the experimental group) dropped out during winter recess (December) due to their work schedule and private matters. One further subject in the experimental group and three further subjects from the control group also dropped out due to leave of absence from school and not undertaking the workout program during vacation, respectively.

As a tool for measuring how the subject exercises in full accordance to the proposed plan, the degree of exercise adherence is defined as the presence ratio which is the percentage of days when exercise occurred out of the total number of exercise days scheduled (three days per week) minus menstruation days (Kim, 2006; Robison and Rogers, 1994). The value will be equal to exercise days in six months divided by 66 days times 100.

Skeletal muscle mass, body fat mass and total mass were measured with a body fat mass analyzer (Biospace, Inbody 520, Seoul, Korea). For consistency, measurements were taken before starting exercise with an empty stomach and bladder.

Back strength, flexibility, and muscle endurance strength were measured by a worker in the college’s physical fitness measurement center. Back strength was measured using a back-strength measurement instrument (Helmas SH2000D, Seoul, Korea) with subjects lifting the handle fully and slowly while bent forward at 30 degrees, legs outstretched and eyes looking forward. Flexibility was measured with a sit and reach measurement instrument (Helmas SH2000G, Seoul, Korea) by taking the higher value from two measurements, letting subjects stretch their knees and push

Table 1. Research design

| Group             | Pretest | Exercise | Treatment | Posttest |
|-------------------|---------|----------|-----------|----------|
| Experimental group| E1      | E1       | EMPOWER steps | E2       |
| Comparison group  | C1      | C1       | None      | C2       |

*Pretest: Exercise motivation, physical fitness. *Posttest: Exercise adherence, Physical fitness. *Exercise: Jane Fonda’s Original Workout Beginner Course.
the sensor at maximum distance. Muscle endurance strength was measured with abdomen curl-up counters (Helmas SH2000N, Seoul, Korea), by letting the subject lie down on a measurement board with his/her ankles fixed. The machine registers a count with a beep only when the subject reaches the precise up and down positions.

The selected exercise program for this study is Jane Fonda’s Workout beginner’s course which is aesthetic gymnastics for women’s health. One workout is a total of 35 min. Subjects showed a stable pulse rate of 72-78, and maximum pulse rates during exercise of 148-152; approximately 60%.

It is necessary that the intrinsic motivation education induce knowledge, behavior and attitude because motivation whether intrinsic or extrinsic will change maintenance of steady exercise. This education has been identified by literature review about the important of exercise through the effect of education, experience education skill and changing attitudes by process of EMPOWER. It defined empowered motivation as exercise development of the power latent within one and making a habit to live a successful life. It was implemented within the experimental group through a 7-step empowered motivation program as follows (Table 2).

Collected data were analyzed with the SPSS program. The methods used in analysis are as follows.

1) Normal distribution was confirmed through Shapiro-Wilk normality test.

2) T-test was used to assess the homogeneity of dependent variables and general characteristics of the subjects.

3) Odds ratio and t-test were performed in order to assess the hypothesis regarding exercise adherence in groups.

4) ANCOVA was used to compare physical fitness in the experimental group with that of the control group.

RESULTS

Homogeneity test of general characteristics

The average age of the subjects was 21.28 yr in the experimental group and 20.21 yr in the control group. The average height of the subjects was 160.61 cm in the experimental group and 158.85 cm in the control group. The average basal metabolic rate of the subjects is 1245.06 kcal in the experimental group and 1191.74 kcal in the control group. The average diet habit in the subjects is 25.06 in the experimental group and 26.58 in the control group. The average motivation is 77.39 in the experimental group and 78.37 in the control group. Even though the experimental group was lower than the control group there was no significant difference between both groups (Table 3).

The homogeneity test result in both groups suggest that there was no significant difference between groups in homogeneity of

Table 2. Empowered motivation program

| Purpose | Education contents (theoretical rational) | Program tools |
|---------|----------------------------------------|--------------|
| Steps   | Education Exercise effect: Effect and composition of Jane Fonda’s workout, breathing methods, injury prevention, teaching about health legacy (Social Cognitive theory, Self-determination theory, Integrat-ed motivation theory). | PowerPoint teaching data, female pain assessment figure, DVD (legacy) |
|         | Measuring oneself: Prescription of Exercise with Self physical fitness sheet and assessment tool of motion mastery (Self efficacy theory, theory of Self-evaluation). | Self Physical fitness sheet (pretest), assessment tool of motion mastery Teaching time: 30 min |
|         | Planning workout: Make exercise plan table according to the exercise motives and aims and contract with researcher to keep the plan (Self-determination theory, Theory of Planned behavior, Goal attainment theory). | Exercise contract Teaching time: 30 min |
|         | Outcome expectation: Teaching the comprehensive effect of exercise and method of goal attainment, Imagine the changed figure if the written oath is kept (Expectancy-value theory). | Home-base education data (PPT) Exercise contract Teaching time: 30 min |
|         | Workout Keeping: Identified maintenance obstacle factors through phone interview, help and encourage to make a scheme to overcome the obstacles (Self-control theory, Relapse prevention theory). | Self Physical fitness sheet Exercise prescription (2nd) Home-base education letter |
|         | Enjoying workout: Make known the pleasure of flow, sense of effect about change, emphasize the importance of habits (Theories about emotion, Flow theory). | Home-base Education letter |
|         | Rewarding oneself: Self-evaluate and reward the degree of adherence with a exercise calendar, show a figure of change to keep in the future, emphasize the importance of adherence (Integrated motivation theory, Self-evaluation theory). | Self Physical fitness sheet (posttest), Exercise Adherence calendar, motion assessment tool of motion mastery Teaching time: 30 min |
general characteristics such as age, height, basal metabolic rate, diet habits and motivation.

**Homogeneity test of dependent and intervening variables**

The results of Homogeneity Test in Dependent and Intervening Variables in both groups showed no significant difference before intervention. Weight of the subjects was 58.92 kg in the experimental group and 54.61 kg in the control group. Body fat mass of the subjects was 21.40 kg in the experimental group and 20.47 kg in the control group. Skeletal mass was 21.40 kg in the experimental group and 20.47 kg in the control group. Even though the experimental group was higher than the control group, there was no significant analysis difference between both groups. Helmas physical tests reported that back strength was 64.94 kg in the experimental group and 66.21 kg in the control group. The flexibility of subjects was 14.86 cm in the experimental group and 17.85 cm in the control group. Back strength and flexibility of the control group were higher than in the experimental group. Muscle endurance of the experimental group was 13.33 and the control group was 10.79, showing that the experimental group was higher than the control group but there was no significant difference in both groups. The intervening variable, which was exercise effect, was 70.67 in the experimental group and 71.95 in the control group. The score of self-efficacy was 815.56 in the experimental group and 888.47 in the control group. Self-efficacy of the control group was higher than the experimental group but there was no significant difference (Table 4).

**Motivation of exercise participants**

The subjects’ motivation for participating in this study’s workout are measured by the following categories: weight control, beautiful body fitness, good chance to learn, promote fitness, improved body fitness, improved motor ability, sense of achievement (Table 5).

**Verification of hypothesis**

H1: “The degree of adherence to the exercise program will be higher in the experimental group than the control group.”

Both groups had similar monthly changes (Table 6). But the experimental group had a 66.66% success rate (12 out of 18) and the control group had only a 26.31% success rate (5 out of 19). The odds ratio of exercise adherence between two groups is 5.600, meaning that the exercise program adherence of the experimental group will be higher than the control group.

| Table 3. Homogeneity test of general characteristics |
|-----------------------------------------------|
| Characteristics | E.G. (n = 18) M ± SD | C.G. (n = 19) M ± SD | t | P |
| Age (yr) | 21.28 ± 3.30 | 20.21 ± 2.53 | 1.11 | 0.22 |
| Height (cm) | 160.61 ± 4.51 | 158.85 ± 3.82 | 1.28 | 0.21 |
| BMR (kcal) | 1,245.06 ± 135.33 | 1,191.74 ± 80.89 | 1.46 | 0.15 |
| Food habit (score) | 25.06 ± 4.14 | 26.58 ± 4.76 | -1.04 | 0.31 |
| Motivation to exercise (score) | 77.39 ± 13.16 | 78.37 ± 9.50 | -0.26 | 0.80 |

E.G., Experimental group; C.G., Control group; BMR, Basal metabolic rate. P < 0.05.

| Table 4. Homogeneity test of dependent and intervening variables |
|-----------------------------------------------|
| Variables | Classification | E.G. (n = 18) M ± SD | C.G. (n = 19) M ± SD | t | P |
| Physical fitness | Weight (kg) | 58.92 ± 10.32 | 54.61 ± 7.69 | 1.45 | 0.16 |
| Body fat mass (kg) | 19.46 ± 6.95 | 16.35 ± 5.01 | 1.57 | 0.13 |
| Skeletal muscle mass (kg) | 21.40 ± 2.75 | 20.47 ± 2.22 | 1.28 | 0.27 |
| Back strength (kg) | 64.94 ± 19.54 | 66.21 ± 14.53 | -0.22 | 0.82 |
| Sit & Reach (cm) | 14.86 ± 5.88 | 17.85 ± 9.12 | -0.18 | 0.25 |
| Abdomen curl-up (no) | 13.33 ± 3.18 | 10.79 ± 4.16 | 2.08 | 0.08 |
| Experience of exercise effect | 70.67 ± 9.91 | 71.95 ± 10.88 | -0.37 | 0.71 |
| Self-efficacy related to exercise | 815.56 ± 218.58 | 888.47 ± 278.30 | -0.88 | 0.38 |

E.G., Experimental group; C.G., Control group. P < 0.05.

| Table 5. Motivation of Jane Fonda’s workout in both groups |
|--------------------------|
| Variables | E.G. Mean | C.G. Mean |
| Weight control | 4.94 | 4.88 |
| Beautiful body fitness | 4.88 | 4.73 |
| Good chance to learn | 4.61 | 4.68 |
| Improved motor ability | 4.33 | 4.68 |
| Improved body fitness | 4.27 | 4.57 |
| Health maintenance | 4.22 | 4.47 |
| Sense of achievement | 4.22 | 4.36 |

E.G., Experimental group; C.G., Control group. P < 0.05.

| Table 6. Monthly difference in exercise number between both groups |
|--------------------------|
| Month subjects | Sep. | Oct. | Nov. | Dec. | Jan. | Feb. |
| E.G. (18) | 133 | 92 | 86 | 156 | 132 | 58 |
| C.G. (19) | 85 | 100 | 38 | 81 | 109 | 47 |

E.G., Experimental group; C.G., Control group. P < 0.05.

| Table 7. Odds ratio of exercise adherence between both groups |
|--------------------------|
| Adherence | Yes (66.66%) | 5 | 5.60 | 0.01 |
| No | 6 (26.31%) | 14 |

E.G., Experimental group; C.G., Control group. P < 0.05.
group is 5.6 times higher than that of the control group (Table 7). T-test analysis of average presence rate between the two groups showed a statistically significant difference (Table 8). Therefore H1 was supported.

H2: “Skeletal muscle mass will increase more in the experimental group than the control group.”

There was a significant difference between two groups. So H2 was supported (F = 8.45, P = 0.006). The weight also increased 440 g from 58.92 kg to 59.36 kg, while that of the control group decreased 20 g from 54.61 kg to 54.59 kg. However this is not a statistically significant difference (F = 0.94, P = 0.34).

H3: “Body fat mass will decrease more in the experimental group than in the control group.”

The average body fat mass of the experimental group decreased 980 g from 19.46 kg to 18.48 kg, while that of the control group increased 550 g from 16.35 kg to 16.90 kg. Therefore there was a significant decrease in the experimental group compared with the control group. So H3 was supported (Table 9).

H4: “Back strength will increase more in the experimental group than in the control group.”

The back strength of the experimental group increased 1.23 kg from 64.94 kg to 66.17 kg, while that of the control group decreased 1.79 kg from 66.21 kg to 64.42 kg. However, there was not a significant difference (F = 0.04, P = 0.51). So H4 was rejected (Table 9).

H5: “Flexibility will increase more in the experimental group than in the control group.”

The flexibility test, sit and reach length of the experimental group increased by 4.72 cm from 13.83 cm to 18.55 cm, while that of control group decreased 0.31 cm from 17.51 cm to 17.20 cm. However, this was not a significant difference (F = 3.23, P = 0.08). So H5 was rejected (Table 9).

H6: “Muscle endurance strength will increase more in the experimental group than in the control group.”

There was no difference in numbers (13.33) between before and after workout figures in the two groups. In the case of the control group, the average number of abdomen curl-ups decreased by almost 1 from 10.79 to 9.52. The experimental group increased more than the control group. However, there was not a significant difference. So H6 was rejected (F = 3.11, P = 0.08).

**DISCUSSION**

The purpose of this study is to identify the effect of empowered motivation on adherence to exercise programs and physical fitness.

**Participant motivation**

The subjects’ motivations for participating in this study’s workout program were weight control, body fitness, chance to learn, promotion of physical fitness, positive health, improving motor ability, and sense of achievement. Research by Yang (1994) about the motivation of university students to participate in physical activity suggests that female students are more concerned with their physical body shape than male students. Also the study of motivations to engage in physical activity by Kirkpatrick et al. (2005) revealed that female students consider positive health as the most important motivation, followed by weight management, appearance, strength and endurance, avoidance of ill-health, revitalization, and stress management in that order.

The only difference between the two studies was the item ‘chance to learn’. Previous researches focused on various physical activities, whereas this study focused on systemic exercise, leading to the addition of the motivation of learning response about exercise strength in Jane Fonda’s workout, which 81.09% responded.

**Table 8. Difference of exercise adherence between both groups**

| Factors      | Group | M ± SD | t    | P    |
|--------------|-------|--------|------|------|
| Adherence    | E.G.  | 0.55 ± 0.21 | 2.932 | 0.006|
|              | C.G.  | 0.36 ± 0.08  |       |      |

E.G., Experimental group; C.G., Control group. P < 0.05.

**Table 9. Change in physical fitness in pretest-posttest**

| Variables group | Pretest M ± SD | Posttest M ± SD | F*    | P    |
|-----------------|----------------|-----------------|-------|------|
| Weight (kg)     | E.G. 58.92 ± 10.32 | 59.36 ± 9.91 | 0.94  | 0.34 |
|                 | C.G. 54.61 ± 7.68 | 54.59 ± 7.91 |       |      |
| Skeletal muscle mass (kg) | E.G. 21.40 ± 2.75 | 22.26 ± 2.89 | 8.45  | 0.006|
|                 | C.G. 20.47 ± 2.22 | 20.28 ± 2.35 |       |      |
| Body fat mass (kg) | E.G. 19.46 ± 6.95 | 18.48 ± 5.99 | 6.08  | 0.01 |
|                 | C.G. 16.35 ± 5.01 | 16.90 ± 5.20 |       |      |
| Back strength (kg)   | E.G. 64.94 ± 19.54 | 66.17 ± 15.33 | 0.04  | 0.51 |
|                 | C.G. 66.21 ± 14.53 | 64.42 ± 10.61 |       |      |
| Sit & Reach (cm) | E.G. 13.83 ± 8.10 | 18.55 ± 8.61 | 3.23  | 0.08 |
|                 | C.G. 17.51 ± 9.20 | 17.20 ± 8.67 |       |      |
| Abdomen curl-up (no) | E.G. 13.33 ± 3.18 | 13.33 ± 2.42 | 3.11  | 0.08 |
|                 | C.G. 10.79 ± 4.16 | 9.52 ± 5.29 |       |      |

E.G., Experimental group; C.G., Control group. P < 0.05. *F values in analysis of covariance.
Exercise adherence

The degree of adherence to the exercise program in the experimental group showed a 66.66% success rate, and only a 26.31% success rate in the control group. The trends in the two groups’ monthly changes were similar. In terms of adherence to the exercise program, other studies have shown dropout rates within six months of approximately 50%, but comparatively this study was significantly lower at 17.4% (experimental group 14.2%, control group 20.8%) due to education and the continued administration of empowered motivation to the experimental group.

Looking at objective indices of exercise adherence rates, skeletal muscle mass increased more in the experimental group when compared to the control group, whereas body fat significantly decreased. Physical strength increased in the experimental group but did not show a statistically significant difference. It was inferred that no participant continued to exercise more than three days per week in the study groups. The main obstacle to exercise program adherence was the school examination periods.

The decreased number of exercise days in February was due to on-site clinical training from December to February, when some students had difficulty finding a place to exercise, and/or were burdened with excessive assignments and presentation work during their clinical training course. The survey of Rasch Calibration and Evaluation of Perceived Barriers to Exercise and Walking among College Women (Cho and Song, 2003) revealed the main perceived barriers were social-cultural factors, followed by environmental-geographical factors, physical factors, and cognitive factors, in that order. Subsets of barriers to exercise were confidence in continuing exercise, the power of execution, lack of tools, fatigue, and lack of time, which have relevance to this study. Also the study by White’s team (2005) regarding meta-analysis of men and women sustaining physical activity found the rate of continuing exercise was 20-98%. Surveys since 2000 suggested that the rate of continuing walking exercise were 66.5% (Wilbur et al., 2003), 27% (Izquierdo-Porbera et al., 2002), 54% (Morey et al, 2003), 80% (Perri et al., 2002), 88% (McAuley et al., 2003), 36% (Rhodes et al., 2001), 81% (Cox et al., 2003). In the study of Perri et al. study, continuing exercise rate was significantly increased. In their study subjects with sedentary behavior conducted low- to moderate-level exercise and exercised persistently through the effects of education and behavior. Since exercise adherence is affected by various complex factors, intervention should be introduced according to participant’s motivations.

Physical fitness

The primary motivation of participants was weight control for good body shape, and to improve motor ability. The experimental group experienced an increased skeletal-muscular mass and decreased body fat, which was a positive effect of exercise. Since muscle is heavier than body fat, body weight increased by an average 440 g. Jane Fonda’s calisthenics insisted that by cultivating the skeletal muscle, body weight would be the same or increase a little, while the body will appear more slim.

There were many cases of abandonment during exercise and obesity treatment due to lack of weight loss because less body fat increased muscle. Although 80% of participants in this study were within normal ranges for body weight with regard to body fat measurements, 50% were classified as obese-highly obese, and 30% as lean. 7,700 kcal of energy should be burned in order to lose 1 kg of fat. Therefore decreasing meal sizes by a third, and doing one hour of aerobic exercise can lose 1-2 kg within 10 days (Kim, 2007). This study investigated participants’ eating habits then adjusted their exercise and provided education about controlled eating in order to decrease body fat and increase muscle for better body condition and fitness.

The primary harmful influences from lack of exercise are declining strength and vulnerability to disease. Physical strength peaks at some point and then drops. Generally physical strength peaks in one’s twenties and drops sharply in one’s thirties. Therefore someone’s physical strength and health condition in their twenties will have a deep impact on their health throughout the rest of their life, let alone in their thirties, so therefore regular exercise is needed to improve young women’s physical strength.

Back strength naturally decreases with advancing age. However middle-aged women in their forties and fifties who exercise steadily over three years were measured with 69.53 back strength, which is a higher score than some in their twenties. This result inferred that middle-aged women in their forties and fifties who do home chores significantly elevated their back strength score (Kim, 2006).

Flexibility refers to the absolute range of movement in a joint or series of joints, and length in muscles that cross the joints as well as body softness. Flexibility decreases through the ageing process but it could improve by stretching and soft exercise (Son and Choi, 2005). The reason for improvement in flexibility in this study is due to repetitive use of tendon and joints following special procedures from Jane Fonda’s original workout. Flexibility was measured by electrogoniometer, including sit and reach tests. The survey by Jee et al. (2004) took measurements using the same tools (Helmas) and measured 13.95 cm for twenty-something fe-
males. The flexibility test sit and reach length of the experimental group increased by 4.72 cm from 13.83 cm to 18.55 cm, while that of control group decreased by 0.31 cm from 17.51 cm to 17.20 cm.

According to the survey results, it is inferred that middle-aged women in their forties and fifties who continuously exercise gain significantly elevated flexibility to 23.15 cm (Kim, 2006).

Muscle endurance is the ability of a muscle or group of muscles to sustain repeated contractions against a resistance for an extended period of time. With regard to the number of curl-ups, used as an index for muscle persistency strength, there was no difference between before and after workout counts in the experimental group. In the control group, there was a decrease of almost 1, but no significant difference.

Kim (2003) found that muscle persistency strength increased from 12.25 to 13.69 after workout in the experimental group, while it decreased from 10.25 to 10.0 in the control group. Kim et al. (2003) reported that there is a significant increase in flexibility, agility, stability and muscle persistency strength and decrease in body fat ratio. Park (2003) suggested that running increased the bone density, circulation organ strength, power of legs and waist muscles of college women. However there was no significant increase in body fat mass in his study.

Studies supported that selecting exercise adequate to participants’ motivation is important since the effect of adherence to the exercise schedule depends on the kind, intensity, and duration of the selected exercise. The experimental group who received motivation empowerment education showed greater adherence to the exercise program, and consequently also showed more skeletal muscle mass and less body fat mass. There was no significant difference in back strength, flexibility, or muscle persistency strength, which was due to a decrease in exercise during test period after workout and a gradual disappearance of the exercise’s effect after 2-8 weeks (USDHHS, 1996). The subjects in the control group showed no exercise effects, for their exercise adherence decreased before any impacts could emerge.

In this study, female college students, who are statistically least likely to exercise amongst various age and gender groups, participated in an exercise workout program for six months. The participants were divided into an experimental group (18) and a control group (19). The experimental group was provided with the ‘EMPOWER Step Motivation’ enhancement program and individual feedback. In testing the effect of this empowerment on exercise adherence, the experimental group showed 5.6 times higher degree of exercise adherence, which lead to significantly higher skeletal muscle strength and lower body fat mass.

According to these results, it may be concluded that empowered motivation has positive effects on exercise adherence and physical fitness in college women. Therefore it is suggested to actively utilize the EMPOWER Step Program that fosters long-term exercise adherence.

**CONFLICT OF INTEREST**

No potential conflict of interest relevant to this article was reported.

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