DEVELOPMENT AND EFFECT ANALYSIS OF PHYSICAL FITNESS TRAINING PROGRAM FOR COLLEGE STUDENTS

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ABSTRACT

This study used the parameter of the 2017 physical fitness training program to determine if there is an impact in student physical change towards sport education from before and after the program at D University in B City, the Republic of Korea. The participants of this study were 28 male students in the second year of physical education and 18 female students attending D university. The *p*-values of weight and skeletal muscle mass (SMM) were 2.294 (between baseline and after program conduct), 5.374 (between baseline and after program conduct), respectively. Both had shown significant differences and main effects existed amongst the observations of the within-weights and SMM. . The *F* value of the body weight of female college students was 0.912 ($p > 0.05$), which was not significant difference. Exercise intensity is more effective than exercise time. It offered a variety of instructional methods and was based on context. PE instructors and curriculum developers can determine how those education goals should be reached.

Keywords: Exercise intensity, physical fitness training program, skeletal muscle mass.

INTRODUCTION

Evidence for both direct and indirect health effects of physical activity has been reported (Hallal et al., 2006), and the need for ongoing participation in physical activity to stimulate and maintain the health lifestyle. Regular physical activity promotes growth and development and has multiple benefits for physical, mental, and psychosocial health that undoubtedly contribute to learning. For example, to support quality physical education, *Wisconsin's Physical Education Standards*, first published in 1997, has been updated and reformatted (Wisconsin Department of Public Instruction, 2010). It builds upon national standards and includes sections designed to help physical education departments and teachers design high quality physical education curriculum, instruction, and assessment. Higher education teachers and administrators created this document through the assistance of the Wisconsin Association for Health, Physical Education, Recreation and Dance.

Changes of body composition is another key component of a student training program in Department of Physical Education. Strength training, fartlek training, and circuit training can help you increase bone strength and muscular fitness, and it can help you manage or lose weight (Thompson, 2008). Many types of exercises can be used to improve strength. It can also improve students' ability to do everyday activities. Physical education is a socially constructed activity that forms one component of a wider physical culture that includes sport and health/physical activity (Coulter & Chróinín, 2011). The faculty of physical education enjoys training and sports facilities well equipped to satisfy most demanding requirements.

In 2017, during the semester, students were given appropriate exercise to run the PE (physical education) program. The programme was designed for graduates in any field related to

physical education and interested in acquiring professional competencies in physical education. The course participants conducted the modern methods of physical education and sports training, and physical condition assessment. Providing information related to physical fitness, including the importance of fitness to personal health, methods of determining levels of physical fitness, and appropriate avenues through which acceptable levels of fitness can be developed and maintained. For example, stretching exercises and recreation dance can help increase flexibility, which can make it easier for students to do many activities that require flexibility. The physical program will regularly and systematically increase the physical demands placed on body (Kahn et al., 2002). This training method, known as progressive overload, entails switching up training variables such as intensity, volume or weight to keep human body guessing. In addition the programs included strength training of all the major muscle groups into fitness routine at least twice a week.

This study used the parameter of the 2017 physical fitness training program to determine if there is an impact in student physical change towards sport education from before and after the program at D University in B City, the Republic of Korea. The program is intended for coaches and educators with a university degree or a vocational education qualification and relevant work experience, interested in a short-term training to enhance their professional qualification.

METHODOLOGY

Subjects

The research aims to investigate the evidence for development and effect analysis of physical fitness training program for college students. The participants of this study were 28 male students in the second year of physical education and 18 female students attending D university in B city.

Purpose of study

A physical fitness training program was conducted for 2 hours of class once a week for physical education department college students. This program was developed to investigate the effect of physical changes such as body composition and body fat rate among university students.

Height and weight measurement

The socks were removed before stepping on the footpad and the height was measured. The 100% standard weight refers to the ideal value for an examinee given his/her height.

Body composition analysis

Bioelectrical impedance analysis (BIA) is a widely used method for estimating body composition (Morita et al., 1999). With regards to the analysis of body composition, InBody 4.0 BODY ANALYZER BIOSPACE assigns a quantitative value to the various body compositional elements. InBody720 analysis of body composition is based on the 4-Compartment Model (Heyward, 1996). This 4-Compartment Model assumes that body is composed of four different elements: total body water, protein, minerals, and body fat. Weight consists of body water, protein, mineral and body fat mass. Thus, body weight is the sum total of these four body components. Weight = Total Body Water + Protein Mass + Mineral Mass + Body Fat Mass. Percent Body Fat indicates the percentage of body fat to body weight. Percent Body Fat (%) = Body Fat Mass (㎏) / Body Weight (㎏) × 100. The body mass index (BMI) is universally expressed in kg/m^2, resulting from mass in kilograms and height in meters.

Research limitations
We did not consider individual characteristics such as the genetic or psychological factors of the subjects. We did not control the eating area during the study period.

Statistical analyses
Statistical analysis of data is a key step in every scientific researches. The measurements were conducted in three repetitions for each analysis. Data were analyzed using the SPSS version 21 (SPSS Inc, Chicago, IL) statistical software package (IBM Corp, 2012). The results were submitted to an ANOVA with an F test, and when relevant, the **Greenhouse-Geisser** (1959) was used to assess the change in a continuous outcome with three observations across time or within-subjects**.** Means and standard deviations should be reported for each observation of the outcome with Greenhouse-Geisser corrections.

Ethical approval
All students were consented by approved methods before participation. Informed consent is a voluntary agreement to participate in research.

RESULTS
Table 1 was shown the power physical fitness training program on 2017. The warming up consisted of light walking, quick walking, light jogging, and stretching and was 15 minutes. The main training is organized in two parts. One is fartlek training such as shuttle run test. The other is circuit training such as dumbbell, side lateral raise, bent-over row, dead lift, and leg raise. The cooldown was consisted of Recreation dance and stretching for a total of 10 minutes.

Table 1. Power physical fitness training program on 2017

Stage	Contents	Time (min)	Place
Warming up	Light walking	3	A large gym
	Quick walking	2	
	Light jogging	3	
	Stretching	7	
Main exercise	Fartlek training. Example: Shuttle run test ○ Two line tripod (Spacing 15 m), A → B, B→A 1 set of 2 roundtrips ○ 1 set of 4 rounds ○ 1 set and 10 seconds rest ○ As the round progresses, the speed increases ○ Full 5 rounds, consisting of 20 sets	30	
	Circuit training. Example: ① dumbbell → ② side lateral raise → ③ bent-over row → ④ dead lift → ⑤ leg raise ○ Level 1: Composed of core exercise programs ○ Level 2: Dumbbell, elastic band, kettle bell instrument movements ○ Level 3: Increase the number of sports items ○ Level 4: Composed of 3 to 5 sets	30	Weight training room

	○ Level 5: ○ Do not break between exercises		
Cool-down	○ Recreation dance	5	
	○ Stretching	5	

Characteristics of body composition over physical fitness training program were reported in Table 2. The *p*-values of weight and skeletal muscle mass (SMM) were 2.294 (between baseline and after program conduct), 5.374 (between baseline and after program conduct), respectively. Both had shown significant differences and main effects existed amongst the observations of the within-weights and SMM. Their weights and SMM increased slightly through exercise. On the other hand, their percentage of body fat (PBF) decreased slightly (0.53 kg). Thus, the divergent results for % fat change may be attributable to the marked fat loss coupled with changes in lean mass from the exercise. However, both (Body Fat Mass and Percentage of Body Fat) were not shown significant differences. The BMI was slightly worse from 23.97 to 24.04. The significant difference of height is that there is a problem with the student's attitude or the weight of the garment is due to the weight of the thin or thick clothes depending on the season.

Table 2. Differences in body composition before and after participating in the program for men

Measure	Before: mean±SD	After: mean±SD	*t*-value
Height	177.37±4.67	178.03±4.59	3.733**
Weight	75.30±6.85	76.26±6.28	2.294*
Skeletal Muscle Mass	36.84±2.77	37.88±2.85	5.374***
Body Fat Mass	10.81±4.12	10.28±3.53	1.257
BMI	23.97±2.38	24.04±2.08	0.487
Percentage of Body Fat	14.12±4.47	13.35±3.96	1.602

The main effects of the model were assessed with repeated-measures ANOVA ($P < 0.05$). Post hoc testing was followed by paired *t* tests (Bonferonni corrections were applied for multiple comparisons.).
*: Significant, $P < 0.05$.
**: Significant, $P < 0.01$.
***: Significant, $P < 0.001$.

The female college students were the result of a survey of mean 59.54 kg (baseline) and 59.18 kg (after one semester) (Table 3). The body weight of them with exercise decreased about 0.36 kg. The *F* value of the body weight was 0.912 ($p > 0.05$), which was not significant difference. Although the decrease in total body weight of them was correlated with the decrease in body fat mass, there was not shown significant. However, difference between body fat mass was associated with percentage of body fat. They lost a lot of weight and body fat. Difference between total body weights was related to BMI indices and body fat loss. The BMI was slightly improved from 22.13 to 21.92.

Table 3. Differences in body composition before and after participating in the program for women

Measure	Before	After: mean±SD	*t*-value
Height	164.08±4.63	164.36±4.58	2.340
Weight	59.54±5.56	59.18±5.57	0.912
Skeletal Muscle Mass	24.49±1.76	24.67±1.86	0.739
Body Fat Mass	15.06±3.77	14.54±3.54	1.444
BMI	22.13±2.20	21.92±2.16	1.509
Percentage of Body Fat	25.02±4.21	24.30±4.08	1.265

DISCUSSION

Generally, physical education classes in Korea are held for 15 weeks in a semester. 15 weeks enough to detect changes before and after exercise. This study focused on the effectiveness of 15 weeks combined walking, jogging, stretching, repeated fartlek training, circuit training and dance exercise program on body composition changes in male and female college students (Table 1). In male students, significant improvements were observed in percent body fat, skeletal muscle mass, and blood pressure, but not in any of the body fat mass and BMI components. Thus these programs were recommended repeated exercises such as fartlek training, circuit training.

Strength training is often used by athletes to increase their muscle strength, power and endurance, alter their body composition and, ultimately, attain better sport results (Otto et al., 2012; Stachon et al., 2016). There was a significant difference on several scales such as body weight and, SMM in male students but no significant difference in female students. Boys had more intense repetition than girls. The weight of the barbell was much heavier. Therefore, exercise intensity is more effective than exercise time. Studies have reported the effects of high-intensity physical exercise such as reduced subcutaneous adiposity through a certain caloric expenditure in leisure activities; increased fat mass loss; increased lypolitic activity (Tremblay et al., 1994). In an investigation by Grediagin et al. (1995) with a trial design quite similar to that in this study, twelve over-fat, sedentary women were randomly assigned to 1) a high-intensity (80% VO_2max) or 2) a low-intensity (50% VO_2 max) exercise group. Subjects trained 4 times/week for 12 weeks. In fact, research has shown that the common handheld BIA unit underestimates body fat percentage by 8-10%, compared to more accurate research tools (Tansley, 2017). Boy students are less sensitive to height or weight, but girls are sensitive, so they try to look as big as possible, and they try to lower their weight to thin clothes when they are measured. Because of the error, more precise analysis and research are needed. Although there is a significant difference in skeletal muscles and fat mass between boys and girls. The PE program focused on results rather than means. It offered a variety of instructional methods and was based on context. PE instructors and curriculum developers can determine how those education goals should be reached and what additional topics should be addressed. All college students as well as Department Physical Education in D University are required to identify standards, benchmarks, curriculum and assessments in health education. We hope this program will be helpful and will fix it as a more effective solution.

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