Effects of Wearing a Compression Undershirt on Body Composition: the case of wearing for two weeks at low frequency *

Toshimitsu EBISU*1, Koya SATO*2, Masashi MORISAKU*2, Kennya KATO*2, Ryota TAKAGI*2, Kaisei SASAKI*2, Nana FUJIHARA*2, Hirokazu IWAGOSHI*3, Tomohisa YOKOYA*1 and Hiroki SUGIURA*1

*1 Faculty of Sports and Health Sciences, Department of Sports and Health Sciences,

A large number of compression undershirts have been produced on a commercial basis and these have been reported to have healthy effects. Although these healthy effects are reported about body composition, the effects have not been revealed by any scientific research. The purpose of this study is, therefore, to clarify the effects of wearing compression undershirts on body composition.

The variables determined in this study were the following: percent body fat (%Fat), body fat (Fat), %Fat and Fat values in right and left legs and feet and right and left arms and hands, lean body mass (LBM), muscle mass, body mass index (BMI), body weight, blood pressure and pulse rate during rest and amount of physical activity. The results were that none of these variables showed any beneficial effect from the wearing of compression undershirt.

The reason why significant difference was not found is probably that the experiment period, two weeks, was too short and the stimulation by the upper body of the short-sleeved compression undershirt was too weak. In the next study subjects are going to wear a long-sleeved compression undershirt and a compression tights for either six or eight weeks.

This study was supported by a research grant from Fukui University of Technology.

Key Words: Wearing compression undershirt, Body Composition, Wearing for two weeks, Low frequency

1. Introduction

A large number of compression undershirts have been produced on a commercial basis and these have been reported to have healthy effects. These healthy effects are to reduce body fat, to strengthen muscle, to maintain correct posture and so forth. If a compression undershirt can really produce such positive effects, the reduction of body fat becomes possible without chronic exercise and cutting down on caloric intake. These effects, however, have not been clarified scientifically.

Not many research studies on the effects of wearing compression undershirts have been conducted. Some research on applying pressure to a part of the body as pressurizing training indicated that it usually led to muscle hypertrophy and muscle strengthening [1]. Such training is to provide muscle strength training while suppressing the muscles. The training, though, does not seem to reduce body fat.

Another study reported that the wearing compression tights could help alleviate constipation in because the compression tights pressed the abdomen[2]. However, the research did not reported anything on any effects produced on body composition besides the effect on constipation.

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*1 Faculty of Sports and Health Sciences, Department of Sports and Health Sciences
*2 Student, Faculty of Sports and Health Sciences, Department of Sports and Health Sciences
*3 e-GATE, Inc., (910-0102 Kawaiwashizuka Town 40-10, Fukui City, Fukui Pref.)
E-mail: tebisu@fukui-ut.ac.jp

Body composition is related to many factors such as BMI, LBM, muscle mass, amount of physical activity, mental stress and blood pressure and pulse rate during rest. The more muscle mass individuals have, the higher the basal metabolic rate (BMR) they show[3]. If you have a higher BMR, you have greater caloric consumption in daily life which means a good chance to reduce body fat[3].

Mental stress is also related to body composition since the stress usually stimulates the hunger center[3]. Mental stress is again related to blood pressure and pulse rate during rest since stress causes increased blood pressure and pulse rate during rest by stimulating sympathetic nervous system[3]. By determining BMI, LBM, muscle mass, amount of physical activity and blood pressure and pulse rate during rest while wearing a compression undershirt, the effects of wearing a compression undershirt on body composition will be clarified clearly.

The purpose of this study is, therefore, to clarify the effects of wearing a compression undershirt on body composition by determining BMI, LBM, muscle mass, amount of physical activity and blood pressure and pulse rate during rest while wearing a compression undershirt.

2. Methods

Seven male students at Fukui University of Technology volunteered to be subjects in this study. All of the experiments in this study were done between September 25 and October 19, 2018. The first control experiment was done between September 25 and September 28, 2018. The first actual experiment was done on October 2 through October 5, 2018. The second actual experiment was done on October 9 through October 12, 2018. The second control experiment was done on October 16 through October 19, 2018. During the first and the second control experiments, no subjects wore the compression undershirt. On the other hand, during the first and the second actual experiments, all subjects wore the compression undershirt.

It may be thought that wearing a compression undershirt acts on a body unhealthily, the following are carefully considered to clarify the effects of wearing a compression undershirt: (1) Just the upper torso of a short-sleeved compression undershirt was worn to try to ensure the safety of all subjects since it is possible for the pressure to raise blood pressure or to cause discomfort, (2) The subjects' safety was considered paramount, rather than pushing them into more rigorous exercise in the hope of discovering positive effects of the compression undershirt, (3) The experimental period was for just two weeks not to burden subjects in this study, (4) Subjects were told to stop wearing the compression undershirt whenever they felt pain, (5) Written informed consent was obtained from all of the subjects, (6) The subjects' safety was, furthermore, enhanced by this study's having been approved by the Officials Standards Committee for Research Conducted with Human Subjects of Fukui University of Technology (人-2018-07).

The variables determined in all four experiments in this study were the following: %Fat, Fat, %Fat and Fat values in right and left legs and feet and right and left arms and hands, LBM, muscle mass, BMI, body weight, blood pressure and pulse rate during rest and amount of physical activity. The rationale for spurring then determining an increased amount of physical activity was as follows: by putting on a pedometer people usually try to move more actively psychologically. People are looking forward to seeing the number of steps on the pedometer. In this study, wearing compression undershirt also may make people feel nimble and might possibly try to move more actively. Subjects in this study were told to urinate just before the measurement, to be three hours after a meal, and not to carry out vigorous exercise within 12 hours.

Muscle mass can be accurately determined by measuring urinary creatinine excretion as Ebisu[3,4] reported. Muscle mass was, however, estimated by a Multifrequency Body Composition Device (Tanita, Inc., MC-780A). Also %Fat, Fat, LBM, BMI and body weight were determined by the device. Blood pressure and pulse rate values during rest were determined by a Digital Automated Sphygmomanometer (Omuron, Inc., HEM-759P). The amount of physical activity was determined by Physical Activity Meter (Tanita, Inc., AM-112).

The Compression undershirt, by e-GATE, Inc. used in this study was shown in Photo 1. The undershirt is made of 75% nylon and 25% polyurethane. Paired t-tests were used to analyze all data by Ekuseru-Toukei 2012, the Social Survey Research Information Co., Ltd.

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Photo 1. The compression undershirt

3. Results and Discussion

Mean and standard deviation values of all variables before and after the periods are shown in Table 1.

Table 1. Changes in all variables of each period

Variables	1st Control	Experiment	2nd Cntrol
%Fat (%)	17.4 ± 5.4 → 18.0 ± 5.9	17.8 ± 5.1 → 18.3 ± 5.7	17.5 ± 6.2 → 17.6 ± 6.3
Fat (kg)	13.1 ± 5.0 → 13.6 ± 5.7	13.3 ± 5.0 → 13.8 ± 5.5	13.0 ± 5.5 → 13.2 ± 5.6
%Fat, right leg and foot (%)	17.7 ± 4.8 → 18.0 ± 5.0	18.1 ± 4.5 → 18.3 ± 4.6	17.6 ± 5.5 → 17.8 ± 5.1
%Fat, left leg and foot (%)	17.0 ± 5.2 → 17.4 ± 5.4	17.5 ± 4.8 → 17.7 ± 5.2	17.2 ± 6.0 → 17.3 ± 5.8
%Fat, right arm and hand(%)	12.9 ± 3.9 → 13.7 ± 4.2	13.3 ± 3.8 → 13.7 ± 4.0	12.9 ± 4.2 → 13.2 ± 4.2
%Fat, left arm and hand (%)	13.7 ± 4.1 → 14.5 ± 4.5	13.9 ± 4.1 → 14.4 ± 4.4	13.5 ± 4.3 → 13.8 ± 4.6
Fat, right leg and foot (kg)	2.61 ± 1.00 → 2.70 ± 1.05	2.64 ± 0.95 → 2.73 ± 1.01	2.56 ± 0.98 → 2.63 ± 0.99
Fat, left leg and foot (kg)	2.51 ± 0.99 → 2.59 ± 1.08	2.56 ± 1.00 → 2.59 ± 1.01	2.46 ± 1.04 → 2.53 ± 1.08
Fat, right arm and hand (kg)	0.50 ± 0.18 → 0.53 ± 0.20	0.47 ± 0.21 → 0.53 ± 0.21	0.50 ± 0.19 → 0.50 ± 0.20
Fat, left arm and hand (kg)	0.50 ± 0.18 → 0.53 ± 0.21	0.47 ± 0.21 → 0.53 ± 0.21	0.49 ± 0.20 → 0.49 ± 0.20
LBM (kg)	61.0 ± 5.9 → 60.4± 5.9	60.3 ± 6.0 → 60.0 ± 5.7	60.4 ± 6.5 → 60.1 ± 6.3
Muscle Mass (kg)	57.8 ± 5.6 → 57.2 ± 5.6	57.2 ± 5.7 → 56.9 ± 5.4	57.3 ± 6.2 → 57.0 ± 6.0
BMI	24.9 ± 3.0 → 24.8 ± 3.2	24.7 ± 3.3 → 24.8 ± 3.1	24.6 ± 3.1 → 24.6 ± 3.3
Body Weight (kg)	74.1 ± 8.7 → 74.0 ± 9.4	73.7 ± 9.2 → 73.8 ± 8.8	73.4 ± 8.7 → 73.3 ± 9.1
Systolic B.P.(mmHg)	125.0 ± 10.5 → 126.4 ± 8.0	126.9 ± 6.9 → 125.0 ± 2.9	127.1 ± 9.1 → 123.1 ± 7.0
Diastolic B.P.(mmHg)	80.0 ± 11.2 → 79.0 ± 11.1	77.7 ± 7.2 → 74.6 ± 6.3	76.1 ± 5.9 → 74.7 ± 7.9
Pulse Rate (bpm)	70.4 ± 12.8 → 68.6 ± 12.5	69.3 ± 10.3 → 64.9 ± 10.3	67.6 ± 13.2 → 65.9 ± 10.4
Pedometer (steps)	4,381 ± 1,598 → 4,920 ± 3,239	5,268 ± 3,095 → 5,142 ± 2,770	4,567 ± 2,588 → 4,003 ± 2,414

where: B.P. = blood pressure

Significant differences between results of the difference about each period are illustrated in Table 2. As shown in Table 2, none of the variables besides t-ratios of Fat values in right and left arms and hands show significant difference. None of the variables in this study indicated significant difference between the actual experiment that subjects wore the compression undershirt and the first control experiment where subjects did not. The reason why significant difference was not found is probably that the experiment period, two weeks, was too short and the stimulation by the upper body of the short-sleeved compression undershirt was too weak. Results of significant difference of Fat values in right and left arms and hands, however, need to be clarified by conducting further studies.

Table 2. T-ratios of all variables between the each two periods

Variables	1st Control vs. Experiment	vs. 2nd Cntrol
%Fat	0.086	0.917
Fat	0.073	0.945
%Fat, right leg and foot	0.326	0.000
%Fat, left leg and foot	0.287	0.084
%Fat, right arm and hand	1.206	0.171
%Fat, left arm and hand	0.778	0.645
Fat, right leg and foot	0.000	0.354
Fat, left leg and foot	0.701	0.701
Fat, right arm and hand	1.549	3.873**
Fat, left arm and hand	1.549	2.828*
LBM	0.572	0.115
Muscle Mass	0.583	0.075
BMI	0.510	0.583
Body Weight	0.476	0.559
Systolic B. P.	0.801	0.453
Diastolic B. P.	0.561	0.740
Pulse Rate	0.886	0.717
Pedometer	0.540	0.282

(* $p<0.05$, ** $p<0.01$)

This study was done as a pilot study of a future study to clarify the effects of wearing the compression undershirt on body composition, relaxation, amount of physical activity, blood pressure and pulse rate during rest, BMI, LBM, and muscle mass. In the next study subjects are going to wear a long-sleeved compression undershirt and a compression tights as shown in Photo 2 for either six or eight weeks.

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Photo 2. The long-sleeved compression undershirt and the compression tights

4. Conclusion

The purpose of this study was to clarify the effects of wearing a compression undershirt on body composition by determining BMI, LBM, muscle mass, amount of physical activity and blood pressure and pulse rate during rest while wearing a compression undershirt. As results of this study, it was found that none of the variables in this study indicated significant difference between the actual experiment that subjects wore the compression undershirt and the first control experiment where subjects did not .

This study was done as a pilot study of a future study to clarify the effects of wearing the compression undershirt on body composition, relaxation, amount of physical activity, blood pressure and pulse rate during rest, BMI, LBM, and muscle mass.

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