



Original Article

The effect of ball exercise on the balance ability of young adults

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Abstract. [Purpose] The aim of this study was to investigate the effects of static and dynamic balance by using Medicine-ball and Swiss-ball exercises. [Subjects and Methods] Thirty-six normal adults who agreed to participate were included in the study. Subjects were randomly assigned to the Medicine-ball (n=18) and Swiss-ball groups (n=18). The participants performed the exercise for 6 weeks. Balance error scoring system and one leg standing test were performed to determine static balance, and functional reach test and timed up and go test were performed to determine dynamic balance. [Results] A significant improvement was observed from the Medicine-ball and Swiss-ball exercises, but no difference was found between the groups. In addition, a significant difference was found between balance error scoring system, one leg standing test and functional reach test after pre- and post-exercise of the Medicine-ball and Swiss-ball. [Conclusion] The findings of this study showed that the Medicine-ball and Swiss-balls were effective in improving static and dynamic balance.

Key words: Medicine-ball, Swiss-ball, Balance

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INTRODUCTION

Balance is an essential functional element of activity of daily living (ADL), such as sitting, standing up, and walking¹⁾. The Medicine-ball and Swiss-ball exercises can be used to promote balance in ADL. Swiss-ball exercises are widely used because they can improve strength, endurance, flexibility, coordination, and balance²⁾. In contrast, Medicine-ball training is effective in improving exercise speed, agility, strength, and endurance³⁾, because it can improve physical function by integrating lower and upper body training⁴⁾. It is not only effective in flexibility and strength, but also in its own way⁵⁾; hence, it is suitable for sports, such as baseball, tennis, golf, and hockey, with many rotational movements wherein momentary strength and speed play a major role⁶⁾. Particularly, it is possible to safely perform high-intensity movements in the form of force acting on the ground, such as upper limb movement⁷⁾.

Many validation exercises improve balance by using the popular Swiss-ball. In contrast, Medicine-ball exercises have been mainly used for training in sports activities, but research on improving balance ability in ADL is lacking. Therefore, this study was conducted to compare the effects of two exercises by evaluating balance ability before and after exercise with the Medicine-ball and Swiss-ball in 20-year-old adults. In addition, we will also investigate Medicine-ball exercises that normal adults can effectively perform ADL.

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SUBJECTS AND METHODS

Thirty-six normal adults who agreed to participate in S university students in Korea were included in the study. Furthermore, they were randomly divided into 18 Medicine-ball groups 18 Swiss-ball groups and in Table 1. The Medicine-ball was 19 cm in diameter, and considering muscle strength, the ball weighed 2.5 and 1.25 kg for males and females, respectively. The Swiss-ball was of a suitable size for exercise, considering the subject's height. 6–9 REPS intensity three times a day, three times a week for 6 weeks was performed. After warm-up for 5 min, exercise with Medicine-ball and Swiss-ball was performed for 35 min, and cool down was performed for 5 min. The Medicine-ball exercise program consisted of nine exercises, including a one-leg squat, Romanian de-drift, one leg standing, step-jumping, circulating squat, twisted lunge, superman posture, v posture, and ball squat between legs. The Swiss-ball exercise program consisted of the following nine exercises: drawing a Swiss-ball, climbing a wall, pushing a thigh, turning a bridge, turning a ball, kneeling, lifting a leg, raising a body on a ball, and lifting a torso from a ball.

Balance error scoring system⁸⁾ (BESS) and one leg standing test⁹⁾ (OLST) were performed before and after the experiment to determine the static balance, and functional reach test¹⁰⁾ (FRT) and timed up and go test¹¹⁾ (TUG) were performed to evaluate the dynamic balance. Statistical analyses were performed using SPSS version 20.0 software. The pre exercise and post exercise results were examined using the paired t-test within each group of subjects, and the independent t-test between the groups. The level of significance was set at $p < 0.05$.

RESULTS

A significant difference was found between BESS, OLST, and FRT after the pre- and post-exercise of the Medicine-ball ($p > 0.05$) and Swiss-ball ($p > 0.05$). In particular, TUG decreased by 0.25 sec post-exercise in the Medicine-ball group and was statistically significant. Changes of pre–post exercise of subjects are summarized in Table 2.

DISCUSSION

The purpose of this study was to investigate the effect of exercise on balance between the Medicine-ball and Swiss-ball and to compare the effects of the two exercises. Static balance was measured with BESS and OLST, and dynamic balance was measured using FRT and TUG.

A significant increase in balance ability in both groups was shown in BESS. The lower the BESS score, the better the balance ability. In contrast, an average score of 1.34 points was shown in the Swiss-ball group. The elasticity of the ball was speculated to act as unstable ground. A significant increase in balance ability in both groups was shown in OLST. However, the Medicine-ball group was increased by an average of 2.88 seconds, and ball weight and squat movement seemed to influence muscle strength. This is consistent with previous studies wherein Swiss-ball exercises had a positive effect on OLST¹²⁾.

Table 1. General characteristics of the subjects

	Medicine ball group (n=18)	Swiss ball group (n=18)
Gender (male/female)	14/4	13/3
Age (years)	22.3 ± 2.0	22.2 ± 1.9
Height (cm)	171.7 ± 6.2	170.8 ± 6.5
Weight (kg)	68.0 ± 10.7	64.6 ± 11.1

Values are mean ± SD.

Table 2. Comparison of static and dynamic balance

	Medicine ball group (n=18)		Swiss ball group (n=18)	
	Pre	Post	Pre	Post
BESS (scores)	15.8 ± 5.2	11.1 ± 4.7 ^a	19.3 ± 11.1	13.2 ± 8.5 ^a
OLST (sec)	17.0 ± 8.2	23.1 ± 12.7 ^a	16.4 ± 10.6	19.6 ± 10.1 ^a
FRT (cm)	34.1 ± 4.9	36.3 ± 4.7 ^a	32.1 ± 4.9	35.8 ± 5.1 ^a
TUG (sec)	8.13 ± 0.64	7.88 ± 0.70 ^a	8.32 ± 1.20	7.97 ± 1.03

Values are mean ± SD. BESS: balance error scoring system; OLST: one leg standing test; FRT: functional reach test; TUG: timed up and go test, ^aStatistically significant difference between pre-test and post-tests ($p < 0.05$).

A significant increase in dynamic balance ability in both groups was shown in the FRT. This is consistent with previous studies that Swiss-ball exercises have a positive effect on FRT. Swiss-ball exercise has been speculated to contain many exercises to stimulate the core muscle. A significant increase in balance ability in the Medicine-ball group was shown in TUG, but no significant difference was found in the Swiss-ball group. TUG was found to be more effective with Medicine-balls. This is a different result from previous studies wherein exercise with the Swiss-ball had a positive effect on TUG¹³). However, if the duration of the study is prolonged, the same effect is expected to be seen.

Both the Medicine-ball and the Swiss-balls were shown to be effective in balancing ability. Particularly, in the case of Medicine-balls, the size is small; hence, it is useful in a narrow space. In addition, because it has a heavy weight and affects muscle strength enhancement, it is considered effective for dynamic balance ability. Therefore, it is speculated that the Swiss-ball exercise can be partly replaced with the Medicine-ball exercise. In this study there was a limit even though it consisted of several exercise programs to promote balance. In future research, additional research set up with a combination of various exercise programs is necessary.

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