



## **Effects of a 16-Week Combined Exercise Program on Isometric Ankle Strength and Gait Velocity in a Selected Sample of Korean Girls**

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### **Dear Editor-in-Chief**

In clinical practice, regular exercise shows great potential as a method for promoting physical health measures such as weight management and preventing a variety of diseases (1-2). Furthermore, regular exercise has been shown to yield both psychological (e.g., improve anxiety, mood, and depression) and social benefits (e.g., self-esteem and social interaction) (3-4). Several recent studies have reported greater effects of combined exercise on physical fitness and conditions (5-6). However, little existing evidence supports the effects of combined exercise on elementary school students.

Therefore, the purpose of this study was to examine the effects of a 16-wk combined exercise-training program on isometric ankle strength and gait velocity in Korean female elementary school students.

A sample size of 12 participants was deemed necessary, based on a repeated analysis of variance measure with a 2 x 2 design, an anticipated statistical power of 0.80, an alpha error probability of 0.05, and an effect size of 0.5 (G-power program 3.1.3, Heinrich Heine Universität Düsseldorf, Düsseldorf, Germany). All participants were 8–11-yr-old elementary students at the children's fitness center in Seoul, Republic of Korea and had an average age ( $\pm$  standard deviation) of  $9.00 \pm 1.04$  yr, average height of  $129.00 \pm 5.34$  cm, average

weight of  $27.96 \pm 3.80$  kg, and average body mass index of  $16.78 \pm 1.85$  kg/m<sup>2</sup>. None of the participants exercised regularly or had any health problems. All participants and their parents submitted written consent forms. All study procedures were approved by the SM Sports Rehabilitation Clinic.

Participants were randomly assigned to either the combined exercise ( $n = 6$ ) or control ( $n = 6$ ) group. All participants in the combined exercise group performed a 60-min main exercise program that comprised 30 minutes of treadmill running at an intensity of 60–80% of their heart rate reserve, followed by 30 min of resistance training with a maximum of 10–15 repeats for each exercise type. To measure the isokinetic ankle strength, a Pelican 1150 device (Pelican Products, Torrance, CA, USA) was used to determine the muscle strength (kg) of the right ankle in dorsiflexion, plantarflexion, inversion, and eversion. To measure gait velocity, a GaitRite device (CIR System Inc., Sparta, NJ, USA) was used to determine the gait velocity (seconds). A repeated analysis of variance was used to evaluate significant changes in dependent variables before and after the 16-wk combined exercise program in the combined exercise group relative to the control group.

All analyses were performed using SPSS version 18.0 (SPSS Inc., Chicago, IL, USA). The statistical significance level was set at  $P < 0.05$ .

Changes in the isometric ankle strength and gait velocity after 16 wk of combined exercise training are shown in Table 1. No significant differences in interaction effects (time X group) were observed

on dorsiflexion, plantarflexion, inversion, eversion, and gait velocity were observed between the combined exercise and control groups.

**Table 1:** Changes in isometric ankle strength and gait velocity after 16 wk of combined exercise training

Categories	Exercise	Pre-exercise	Post-exercise	Interaction (Group X Time)	
				F	P
Dorsiflexion (kg)	Control	7.62 ± 0.92	9.15 ± 2.87	1.685	0.233
	Combined	7.20 ± 1.86	7.18 ± 1.31		
Plantarflexion (kg)	Control	18.38 ± 5.84	18.87 ± 3.60	3.960	0.075
	Combined	12.85 ± 3.43	18.72 ± 5.77		
Inversion (kg)	Control	6.65 ± 2.68	7.07 ± 3.21	0.414	0.534
	Combined	5.57 ± 1.90	7.32 ± 2.79		
Eversion (kg)	Control	6.25 ± 1.94	6.60 ± 3.08	0.101	0.757
	Combined	5.08 ± 2.00	6.03 ± 2.97		
Gait velocity (cm/sec)	Control	61.85 ± 26.44	72.69 ± 34.64	0.653	0.438
	Combined	42.41 ± 17.16	77.92 ± 42.95		

Determined using a 2-way repeated analysis of variance

We concluded that a 16-wk supervised combined exercise program did not affect the isometric ankle strength and gait velocity in our sample of Korean female elementary school students.

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