

Effect of wireless rope skipping exercise on growth factors and physical fitness in elementary school students

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1. Introduction In elementary school, health care is very important for physical and mental growth of students. It has been known that rope skipping exercise could improve physical fitness and growth factors on child. But, rope skipping has high frequency to injury and it is difficult to continue exercising due to monotonous movement pattern. According to recent studies, it has been reported that wireless rope skipping promotes According to recent studies, it has been reported that wireless rope skipping promotes

Table 3. Adult height predictor test and bone age

Variable	Group	Pre	Post	t	Р
	CG	165.14±11.01	164.06±10.93	0.956	.006
	RSG	166.00±10.44	168.28±9.97	-3.568	.001
AHP-BP(cm)	WRSG	167.17±12.06	168.78±12.83	-4.867	.364
	F	0.083	0.526		
	Р	9.21	.597		
	CG	168.90±9.15	168.58±9.91	.428	.101
	RSG	168.45±8.49	171.81±8.80	-1.8280	.000
AHP-TW(cm)	WRSG	170.42±9.54	172.07±9.52	-6.072	.680
	F	0.129	0.502		
	Р	.880	.611		
	CG	11.25±1.89	11.99±1.12	-1.750	.057
Bone age	RSG	11.50±1.16	11.04±1.34	2.184	.306
	WRSG	11.05±1.30	10.72±1.26	1.086	.114
	F	.228	2.082		
	Р	.797	.078		

- According to recent studies, it has been reported that wireless rope skipping promotes physical fitness as well as decreases injury frequency more than rope skipping.
- Thus, the purpose of this study was to investigate effect of wireless rope skipping for 12 weeks on the growth factors and physical fitness in elementary school students.

2. Materials and Methods

2.1 Participants

Subjects for this study were 30 elementary school students and randomly divided into 3 groups as follows.
A rope skipping group (n=10. male=5, female=5), wireless rope skipping group (n=10. male=5, female=5) and control group (n=10. male=5, female=5).

Table 1. Physical characteristics of the subjects

Variable	CG	RSG	WRSG
Age (yr)	10.72±0.43	10.50±0.53	10.33±0.25
Height (cm)	141.68±8.24	142.47±4.36	141.22±5.37
Weight (kg)	36.02±6.03	38.33±7.98	37.99±6.34
BMI (kg/m²)	17.55±2.71	18.79±3.08	18.98±2.84

Values are mean ± Standard Deviation

CG, control group; RSG, rope skipping group; WRSG, wireless rope skipping group; BMI, body mass index

2. 2 Growth factors test

- Growth factors were composed of adult height predictor (AHP) and bone age X-ray test.
- The AHP test was measured by using BP (Bayley-Pinneau) and TW (Tanner-Whitehouse) methods.
- Bone age test was measured by using special ultrasonication techniques (Sunlight Medical Ltd., Israel) and the RUS(Radius, Ulna and Short bones of hand) and CARP (Carpal bones) score were represented.

2. 3 Physical activity promotion system(PAPS) test

• PAPS test was composed of body mass index, grip strength, 50M run, sit and reach and 15M shuttle run and each factors were represented as absolute values.

2. 4 Statistical analysis

- All measurement values are presented as mean±SD
- Significant differences between pre- and post-test were determined by using paired ttest.

Values are mean ± Standard Deviation

CG, control group; RSG, rope skipping group; WRSG, wireless rope skipping group; AHP-BP, adult height predictor Bayley-Pinneau; AHP-TW, adult height predictor Tanner-Whitehouse.

4. 2 Changes of PAPS scores according to types of rope skipping training

- All groups were no significant differences in post-strength and flexibility results.
- RSG(P<.01) and WRSG(P<.01) significantly increased post-cardiovascular endurance compered to CG.
- Post-body mass index in WRSG(P<.01) was significantly increased compared to the other groups.
- RSG(P<.001) and WRSG(P<.004) significantly decreased post-power values compered to those in CG.

Table 4. Physical activity promotion system

		•			
Variable	Group	Pre	Post	t	Ρ
	CG	16.89±3.58	16.52±2.76	0.493	.634
	RSG	16.39±2.16	16.37±2.63	0.060	.954
Strength ⁻	WRSG	16.81±3.58	16.96±3.77	-0.921	.381
(kg) -	F	0.071	0.098		

- Differences between groups were analysed by one-way repeated ANOVA followed scheffe post-hoc test.
- The level of significance was *P*<.05

3. Rope skipping training program

- The rope skipping training was preformed three times a week for 12 weeks at physical education, sports clubs and intermediate play time.
- Training program in rope skipping and wireless rope skipping groups were showed in Table 2.
- Control group was maintained during the same period physical education class in school.

Table 2. Rope skipping and wireless rope skipping training program

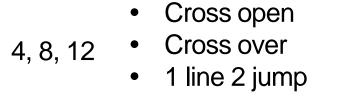
Week	Personal rope skipping	Time	Group rope skipping	Time	
•	Basic bounce	Physical education (40 min, 3 days/week)			
1, 5, 9	Jump rope on one legBoxer step	Intermediate play time			
	·	(20 min, 2 days/week)			
•	Side Double Tapping	Physical education (40 min, 3 days/week)			
2, 6, 10	Forward Double TappingSide Straddles	Intermediate play time			
		(20 min, 2 days/week)	Team rope skipping	Sporte clube	
•	Forward Straddles	Physical education (40 min, 2 days/week)	real rope skipping	Sports clubs (40 min, 1 day/week)	
3, 7, 11	Side and Forward StraddlesHigh Step	Intermediate play time			
		(20 min, 3 days/week)			

	Ρ	.931	.907		
	CG	61.30±23.50	62.60±22.95	-1.285	.231
Cardiovascular	RSG	61.80±22.41	65.20±20.90	-3.392	.008
endurance	WRSG	63.90±20.90	68.40±21.87	-4.392	.002
(count)	F	0.038	0.176		
	Ρ	.963	.840		
	CG	7.22±8.19	7.41±8.12	-1.285	.231
— 1 11 11 1	RSG	9.27±6.49	9.00±7.02	0.608	.558
Flexibility —	WRSG	12.69±5.57	12.55±6.07	0.373	.718
(cm) —	F	1.632	1.366		
	Р	.214	.272		
	CG	10.64±0.76	10.87±1.23	-0.341	.741
	RSG	11.67±1.65	10.82±1.75	6.066	.000
Power –	WRSG	11.66±1.74	10.71±1.53	3.872	.004
(sec) —	F	1.654	0.030		
	Р	.210	.971		
	CG	17.55±2.71	17.67±2.86	-0.3391	.705
— —	RSG	18.79±3.08	18.71±3.25	0.629	.545
BMI	WRSG	18.98±2.84	18.73±2.76	4.038	.003
	F	0.724	0.417		
	Р	.494	.663		

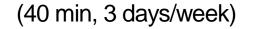
Values are mean ± Standard Deviation

CG, control group; RSG, rope skipping group; WRSG, wireless rope skipping group; BMI, body mass index.

5. Conclusion









(20 min, 2 days/week)



