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Preventive Medicine 42 (2006) 177 – 180
Preventive Medicine
www.elsevier.com/locate/ypmed

Effect of 4 weeks of Pilates on the body composition of young girls

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Available online 27 December 2005

Abstract

Background. There is a need to find ways to increase the physical activity levels and improve the body composition and blood pressure of girls.

Methods. Thirty 11-year-old girls were recruited from two after school programs in Houston Texas in Spring 2005. Participants from one program (16) were randomly assigned to intervention, the other (14) served as controls. BMI, BMI percentile, waist circumference and blood pressure were assessed before and after the intervention. Pilates classes were provided free of charge for an hour per day at the intervention site, 5 days a week, for 4 weeks. Four participants wore heart rate monitors during every session and completed enjoyment and perceived exertion questionnaires. Repeated measures analysis of variance with time (within) and group (between) as factors was performed.

Results. Mean attendance was 75%, mean heart rate 104 bpm, mean perceived exertion 5.9 (1–10 scale) and enjoyment 4.4 (1–5 scale). There was a significant (P = 0.039) time by group interaction for BMI percentile. Graphs indicated that this difference was influenced by large reductions in the BMI percentile of healthy girls.

Conclusions. Girls enjoyed Pilates, and participation for 4 weeks lowered BMI percentile. Pilates holds promise as a means of reducing obesity.

Keywords: Enjoyment; Metabolic syndrome; Overweight; Adolescent; Children

Introduction

Regular physical activity has been associated with a reduced risk of obesity among adolescents, and as girls physical activity levels are particularly low (Jago et al., 2005), there is a need to find innovative ways to increase their physical activity (Jago and Baranowski, 2004). It seems likely that girls will participate more frequently in activities that they enjoy.

Pilates is popular among women (Chang, 2000). Pilates is a series of low impact muscle contraction exercises. The activities train the muscles in the core of the body (Chang, 2000; Siler, 2000). No study has assessed whether girls like to engage in Pilates or if participation in Pilates has positive effects on their body mass, waist circumference or blood pressure. It is also not clear if Pilates places aerobic demands on the body, which could be important for obtaining reductions in fasting insulin (McMurray et al., 2000). The aim of this pilot study was to determine whether girls liked and attended Pilates, the effect of participation in Pilates on body mass, waist circumference and blood pressure.

Methods

Participants were 30, 11.2 (±0.6)-year-old students recruited from two YMCA after school programs within Houston, Texas, in Spring 2005. One site was randomly assigned to intervention (n = 16), the other control (n = 14). Mat-based Pilates classes were offered each day for 4 weeks at the intervention site. Each class was scheduled to last an hour and was led by a YMCA certified mat Pilates instructor. Control group participants engaged in their usual YMCA activities during the intervention period and were offered free Pilates classes once the post data had been collected. The Baylor College of Medicine Institutional Review Board approved this study. Written informed consent was obtained for all participants. All measurements were recorded at baseline and immediately after the study.

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doi:10.1016/j.ypmed.2005.11.010

Table 1
Anthropometric and blood pressure variables at baseline and post-assessment for intervention and control group

	Intervention (n = 16)			Control (n = 14)			Time by treatment effect[a]
	Baseline mean (SD)	Post mean (SD)	Change	Baseline mean (SD)	Post mean (SD)	Change	
Weight (kg)	49.4 (18.8)	48.9 (17.94)	−0.5	43.9 (12.0)	43.9 (11.2)	0	$F(1, 28) = 0.921$, $P = 0.345$
BMI (kg/m^2)	21.6 (5.4)	21.1 (5.6)	−0.5	20.1 (4.8)	20.0 (4.4)	−0.1	$F(1, 28) = 2.795$, $P = 0.106$
BMI percentile	71.2 (23.3)	68.1 (26.2)	−3.1	62.5 (31.7)	63.3 (31.6)	+0.8	$F(1, 28) = 4.701$, $P = 0.039$*
Waist (cm)	74.2 (15.8)	73.09 (15.4)	−1.1	69.1 (14.2)	69.2 (14.5)	+0.1	$F(1, 28) = 1.803$, $P = 0.190$
Diastolic BP (mm HG)	62.7 (6.2)	58.9 (6.9)	−3.8	60.8 (7.6)	60.5 (7.6)	−0.3	$F(1, 28) = 1.810$, $P = 0.189$
Systolic BP (mm HG)	108.2 (9.4)	102.5 (5.6)	−5.7	101.6 (11.80)	102.3 (9.2)	+1.3	$F(1, 28) = 3.513$, $P = 0.071$

[a] Repeated measures ANOVA with time (within) and treatment group (between) as factors.
* $P < 0.05$.

Measures

Date of birth was obtained by self-report and age calculated. Height was measured to the nearest 0.1 cm on a stadiometer (PE-AIM-101, Perspective Enterprises, Kalamazoo, MI) with the participants shoeless. Body weight was measured to the nearest 0.1 kg using a pre-calibrated electronic scale (SECA Alpha 882, Vogel and Halke, Hamburg). Body mass index (BMI) was calculated (kg/m^2) and age and gender specific BMI percentile computed using the Centers for Disease Control program (National Center for Health Statistics, 2000). Waist circumference was recorded to the nearest 0.1 cm at the iliac crest. Research assistants were within 0.5 kg (weight), 0.5 cm (height) and 1 cm (waist circumference) of the first author on at least 90% of a certification group during a pre-study training and certification procedure. Blood pressure was recorded three times using an automated blood pressure monitor (Omron HEM-907, Vernon Hills, IL). The initial value was recorded after the participant had been seated quietly for 3 min with each subsequent value recorded 1 min after the preceding recording. The mean of the second and third readings was used in all analyses. Study staff recorded treatment group attendance at the Pilates sessions. Four randomly selected treatment participants wore Polar heart rate monitors placed in the center of the chest during each Pilates session. The same participants also completed previously validated perceived exertion (1–10 scale) (Robertson et al., 2000) and enjoyment (1–5 scale) questions (Macfarlane and Kwong, 2003) at the end of each session.

Statistics

Mean heart rate, perceived exertion and enjoyment ratings were calculated across sessions, and mean attendance (percent) was calculated. Independent t tests were used to test for differences in participants weight, BMI, BMI percentile, waist circumference, diastolic and systolic blood between the treatment and control groups at baseline. Repeated measures analysis of variance with time (within) and treatment groups (between) as factors was used to test for time by treatment effects on participant's weight, BMI, BMI percentile, waist circumference, diastolic and systolic blood pressure with separate models run for each variable.

Results

There were no significant differences in any of the outcome variables between the two groups at baseline (Table 1). There were no time-related changes in the pattern of attendance, heart rate or enjoyment across the study. Mean intervention attendance was 75% with a mean heart rate of 104 bpm. Mean perceived exertion was 5.9 (1–10 scale) with a mean enjoyment of 4.4 (1–5 scale).

The repeated measures ANOVA yielded a significant time by group interaction for BMI percentile ($P = 0.039$). There was a 3.1 reduction in the BMI percentile of the treatment group while the control group increased by 0.8 percentiles. There was also a time by group interaction that approached significance for systolic blood pressure ($P = 0.071$).

To further investigate the change in BMI percentile, the baseline and post-test BMI percentile variables were plotted separately for the intervention and control groups (Figs. 1 and 2) based on descending initial values. Fig. 1 shows that the change detected was influenced by a small number of cases whose BMI percentile fell considerably as a result of

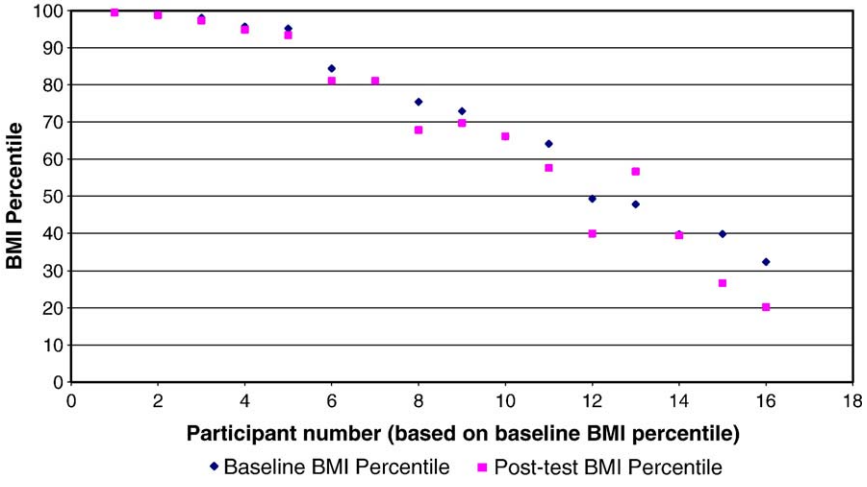

Fig. 1. Baseline and post-test BMI percentile—intervention group.