Exercise Training with Fitness Zone Equipment in Sedentary Hispanic Women: A Pilot Study

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Abstract

Background and Purpose: Limited access to physical activity resources contributes to elevated prevalence of obesity in Hispanic women living in low-income urban Los Angeles neighborhoods. **Purpose**: The purpose of this study was to determine the benefits of training with fitness zone equipment recently made available in public parks. **Methods**: Six overweight, sedentary Hispanic women completed a 6-week combined resistance and cardiorespiratory training program. General health, muscular fitness (repetitions-to-fatigue), and cardiorespiratory fitness (one-mile walk), were assessed pre- and post-training. **Results**: Training significantly decreased weight (-3.5±0.5 lbs.), body fat percentage (-2.1±0.9%), waist circumference (-1.3±0.2 cm), and increased muscular endurance repetitions (squats: 23.4±8.2, push-ups: 12.8±1.8, curl-ups: 13.0±3.3, leg presses: 62.7±15.5, right leg extensions: 18.2±5.6, left leg extensions: 18.5±5.6, chest presses: 20.8±5.4, lateral pull downs: 15.8±3.8, and vertical presses: 5.6±1.2 reps); $p < 0.05$. No change in VO_2max was detected; $p > 0.05$. **Conclusion**: Fitness zone training, for which equipment is freely available at parks, may lead to health and fitness benefits for sedentary women in the initial stages of a weight loss program. Additional muscular strength, cardiorespiratory endurance, and associated health benefits are limited due to the mechanical design and nonadjustable nature of the outdoor equipment.

Keywords: outdoor gym; Hispanic women; public parks; muscular fitness; physical activity, strength training

Introduction

The benefits associated with physical activity participation and physical fitness are well established. However, in 2011, it was estimated that 36.2 percent of Los Angeles adults were sedentary, a disproportionate number of which live in low-income neighborhoods (Office of Health Assessment & Epidemiology, 2011). Furthermore, results from the 1999-2004 US NHANES Survey suggest that compared to the rest of the adult population, Mexican American women are the least likely to participate in weight lifting resistance exercise, which is associated with a higher prevalence of Metabolic Syndrome (Magyari & Churilla, 2012).

Physical activity inequities are related to recreational space proximity and access to physical activity resources (Kaczynski, Potwarka, & Saelens, 2008). A recent survey revealed that only 10.7 percent of southern California residents living in low-income neighborhoods exercise in indoor health clubs (Cohen et al., 2010). As a result, despite limited acreage, public parks play an important role in health promotion in low-income communities. Indeed, Cohen et al. (2007) reported that parks in Los Angeles minority communities were the most common place for physical activity participation. In addition, in a previous study, significantly more men than women were observed performing physical activity in indoor facilities (~5:1) compared to approximately equal numbers of men and women performing physical activity in local parks (~1:1) (Nguyen & Raney, unpublished observations).

Some research has suggested that park facilities (e.g. walking paths, sport fields or courts) may be more important than park proximity (Kaczynski, Potwarka, & Saelens, 2008; Sugiyama, Francis, Middleton, Owen, & Giles-Corti, 2010). Therefore, programs and facilities that encourage physical activity participation in existing outdoor spaces may help change the health disparities among socioeconomic ranks and between genders. Recently, outdoor gyms or fitness zones were introduced into parks throughout Los Angeles County. These gyms contain both cardiorespiratory and strength training exercise equipment that are weather-resistant, non-adjustable, and free to the public. Studies have discovered that fitness zone installation attracts new park-goers and that outdoor gym users engage in substantially more moderate-to-vigorous physical activity than park goers observed in other areas of the same park (Cohen, Marsh, Williamson, Golinelli, & McKenzie, 2012; Cohen et al., 2010).

Purpose

Although studies have demonstrated the benefits of fitness zones on physical activity behavior in relationship to other park locations, a longitudinal study has not been performed to provide further evidence regarding physiological adaptations to training using the outdoor gym equipment. Therefore, the purpose of this study was to examine the effectiveness of a combined cardiorespiratory and resistance training program using Greenfields nonadjustable outdoor gym equipment in female Hispanic subjects.

Methods

Study Design

Subjects completed a 6-week combined strength and cardiorespiratory training program using the Greenfields Core Line Outdoor Fitness Equipment at Sycamore Grove Park in Los Angeles. Throughout the study duration, subjects were instructed to maintain pre-study dietary practices.

Training protocol. During the training phase, subjects performed cardiorespiratory physical activity (elliptical) and a full-body resistance training workout (leg press (LP), unilateral leg extension (LE), chest press (CP), lat-pull down (LPD), and vertical press (VP)) three days per week in the presence of a study researcher. The researcher was present to verify subject compliance, to time cardiorespiratory sessions, to record resistance training repetitions, and to answer subject questions. Before each workout, subjects were reminded to maintain a moderate intensity cardiorespiratory exercise pace as determined by the talk-test and to complete resistance training repetitions at a controlled self-selected pace through the entire range of motion until they reached a rating of 9 on the 1-10 rating of perceived exertion (RPE) scale (Pescatello, Arena, & Thompson, 2014). Subjects completed a minimum of 5 minutes warm-up and 5 minutes cool-down before and after each approximately one hour workout respectively. A minimum of one rest day was given between workouts.

The workout schedule was designed to progressively increase exercise volume according to training principles required for fitness adaptations (Ratamess et al., 2009). Cardiorespiratory exercise duration was increased by 10% each week. Sets per exercise or repetitions per set were increased every week for resistance exercise. Subjects were instructed to complete a maximum of 130 repetitions, which was achieved on LP by 2/6 subjects by the second week of training.

Sample

Six Hispanic female subjects (age: 35.0±9.0 yrs; weight: 154.9±32.6 lbs.; BMI: 28.2±6.2 kgm^{-2}; body fat: 34.6±1.5% (median ± IQR)) were recruited from parent centers at Los Angeles Unified School District (LAUSD) low-income public schools located within two miles of Sycamore Grove Park. This study was limited to overweight (BMI $\geq$ 25kgm^{-2}) subjects who were previously sedentary for at least 6 months and could not afford a gym membership. In our study, sedentary was defined as performing little to no physical activity besides what was required to complete daily tasks. Subjects were excluded from the study if they answered "yes" to any of the questions on the PAR-Q, if they suffered from temporary injury or illness or if they had outside commitments that would affect physical activity participation at the prescribed study frequency.

The Occidental College Human Subjects Research Review Committee approved procedures for this study. Subjects were required to sign an informed consent and to complete the CSEP Physical Activity Readiness Questionnaire (PAR-Q) which asked questions related to presence of medical conditions (e.g. heart disease, bone or joint problems) or physician advice that would limit safe physical activity participation (Pescatello et al., 2014). Prior to data collection, subjects were informed of study design and the risks associated with participation. All verbal instructions and written materials were provided in Spanish and English.

Table 1

Changes in General Health Characteristics Associated with Fitness Zone Training

Characteristic	Mean Difference[a]	$\|t(5)\|$	95% CI	Cohen's d	Effect Size
Weight (lb)	-3.5±0.5*	6.65	-4.8, -2.1	2.71	Large
Body Fat Percentage	-2.1±0.9*	8.40	-3.1, -1.0	3.43	Large
Waist circumference (cm)	-1.3±0.2*	8.00	-1.7, -0.9	3.27	Large
rHR (bpm)	-1.0±1.8	0.54	-5.7, 3.7	n/a	n/a
Systolic BP (mmHg)	1.0±3.0	0.33	-6.7, 8.7	n/a	n/a
Diastolic BP (mmHg)	-2.7±2.7	1.00	-9.6, 4.2	n/a	n/a

[a]Results of one-tailed paired t-test reported as mean absolute difference ± standard error (pre- to post-training).
* Sig. difference, $p < 0.05$.

Measures and Data Collection

Prior to data collection, subjects completed a trial run on all exercise equipment in order to facilitate comfort and to give the researcher an opportunity to correct form mistakes. The following general health and physical fitness parameters were determined pre- and post-training: weight, body fat percentage (%BF), resting heart rate (rHR), blood pressure (BP), waist circumference, VO_2max, and full body muscular fitness. Lange skinfold calipers were used to estimate body fat percentage according to the three-site Jackson-Pollock formula (Pescatello et al., 2014). Blood pressure was measured with the Omron HEM18 manual BPmonitor. The Rockport One-Mile Fitness Walking Test was used to estimate VO_2max (Pescatello et al., 2014). To assess full-body muscular fitness, subjects performed a modified push-up test, squat test, and curl-up test, in addition to repetitions-to-fatigue on LP, LE, CP, LPD, and VP (Hoeger & Hoeger, 2013; Pescatello et al., 2014). Repetition speed was controlled at 30 repetitions per minute (60 bpm) with a Seiko DM50 compact metronome for the squat, curl-up, and machine repetition-to-fatigue tests, and at 28 repetitions per minute (54bpm) for the push-up test. Tests were terminated and repetitions-to-fatigue recorded when subjects could not keep pace with the metronome or experienced significant deviation in form or range of motion.

Data Analysis

All analyses were performed using IBM SPSS Statistics version 20. Pre- and post-training general health and fitness variables were compared with one-tailed paired t-tests at a significance level of 0.05. Cohen's d was used to calculate effect size.

Results

Despite the small sample size, the 6-week training program resulted in a significant decrease in body weight, %BF, and waist circumference ($p < 0.05$). No change in rHR or BP was detected ($p > 0.05$) (Table 1). Training also significantly increased the number of repetitions-to-fatigue for all exercises ($p < 0.05$) (Table 2). Cardiorespiratory endurance was not changed ($VO_{2max} = 0.6±0.5$, $|t(5)| = 1.02$, $p > 0.05$).

Table 2

Changes in Muscular Fitness Associated with Fitness Zone Training

Exercise	Mean Difference[a]	$\|t(5)\|$	95% CI	Cohen's d	Effect Size
Squat	23.4±8.2*	2.87	1.0, 46.1	1.17	Large
Push-Up	12.8±1.8*	6.39	8.3, 17.4	2.61	Large
Curl-Up	13.0±3.3*	3.97	3.9, 22.1	1.62	Large
Leg Press	62.7±15.5*	4.04	22.8, 102.5	1.65	Large
Right Leg Extension	18.2±5.6*	3.27	4.0, 32.4	1.34	Large
Left Leg Extension	18.5±5.6*	3.28	4.0, 33.0	1.33	Large
Chest Press	20.8±5.4*	3.89	7.0, 34.6	1.6	Large
Lat Pull Down	15.8±3.8*	4.12	6.0, 25.7	1.7	Large
Vertical Press	5.6±1.2*	4.80	2.4, 8.8	2.0	Large

[a]Results of one-tailed paired t-test reported as mean absolute difference in repetitions completed ± standard error (pre- to post-training).
* Sig. difference, $p < 0.05$.

Discussion

Data collected in the present study suggest that sedentary women may benefit from a progressive exercise training program using fitness zone equipment. A 6-week combined cardiorespiratory and full body resistance training program at a frequency of 3 days per week was linked to decreased body weight, body fat percentage, and waist circumference of previously overweight sedentary Hispanic women. In addition, training with fitness zone equipment was linked to significant improvements in upper body, lower body, and trunk muscular fitness and maintenance of cardiorespiratory fitness.

A previous study performed in our lab demonstrated that during tests-to-fatigue identical to those performed in this study, sedentary subjects completed significantly more repetitions with fitness zone equipment when compared to similar resistance-adjustable machines indoors at 60% of their one repetition maximum (1RM) (Nguyen & Raney, unpublished data). These results suggest that the resistance of fitness zone equipment is below 60% of 1RM, the intensity required to induce significant gains in hypertrophy and muscular strength (Pescatello et al., 2014). Therefore, most of the improvements in muscular fitness measured in the current study are likely the result of an increase in muscular endurance and not due to a change in muscular strength, which is supported by the lack of delayed-onset muscle soreness experienced by subjects.

By the 6th week of training, subjects were averaging more than 30 repetitions per set for RLE, LLE, CP, LPD and more than 110 repetitions per set for LP in a workout consisting of four sets per exercise. Although all subjects indicated that they plan to continue using fitness zone equipment in the future, the number of repetitions required for the maintenance or improvement of training-induced adaptations may restrict the use of fitness zones in long-term physical activity programs. Greenfields Outdoor Fitness, the manufacturer of the outdoor fitness zone equipment tested in this study, recently introduced a new line of hydraulic outdoor equipment complete with eight resistance levels, but this equipment is not currently available in low-income neighborhoods. As a result, individuals who cannot afford indoor gym memberships and do not supplement fitness zone resistance training with other strength training modes will be unable to optimize muscular strength and associated health benefits. Physical activity and obesity disparities based on gender and socioeconomic status in low-income neighborhoods are therefore likely to persist at least to some degree.

Limitations

This was the first study to assess the training potential of fitness zone equipment. Subjects were well matched for age, weight, and physical activity experience. The training program was well controlled. Despite these strengths, the study had limitations. In order to minimize impact to a community who relies heavily on the fitness zone equipment and to regulate training sessions, the subject population was necessarily small. In addition to a small sample size, subject diet was not directly monitored. It is also unclear whether the increase in physical activity and caloric expenditure, the specific use of outdoor fitness equipment and subsequent improvements in muscular fitness, or a combination of the two resulted in the aforementioned health benefits.

In conclusion, training with fitness zone equipment may induce significant health and physical fitness improvements for sedentary adult women in the initial stages of a weight loss program. However, benefits of training may soon plateau due to the mechanical design limitations and nonadjustable nature of the outdoor equipment.

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