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Measuring the Intensity of Different Exercise Routines in Grenada's Sports for Health Program

Research Article

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Abstract

Objective: This study evaluated the effectiveness of the community based Sports for Health program by measuring participant effort in units of Metabolic Equivalents (METs).

Design and Methods: The study was a cross-sectional design located in the training camp of the Royal Grenada Police Force. The population consists of participants enrolled in the Sports for Health program at different levels of introductory, intermediate and advanced as well as across the activities of aerobics, jogging and dance. The study collected data from individuals as they completed a single exercise program per day. Once enrolled in the study, an accelerometer attached to an elastic cord was placed around the participant's upper left arm by researchers of the same gender when available. The "GT3X Activity Monitor" three-axis accelerometers by Actigraph were used during the study.

Results: The study provided evidence that the Advanced and Intermediate level exercises both induce higher METs averages than the Beginner level exercises among 167 persons evaluated. The dance class induced more participant effort than both the jogging and aerobics sessions. While jogging and aerobics classes produced lower METs in participants than the dance class, all forms of exercise produced METs outputs comparable to other recorded exercises.

Conclusion: The Sports for Health program was found to be effective at producing participant intensity at levels equal to or greater than similar exercises programs. These METs levels provide evidence that the community based program will be effective at mitigating chronic diseases in Grenada by increasing physical activity and decreasing sedentary lifestyle.

Keywords: Metabolic Equivalents; METs; Accelerometer; Grenada.

Introduction

Grenadian citizens are vulnerable to health risks for diabetes, hypertension, and cardiovascular disease. To combat risk factors for these diseases, the government has set up exercise programs to increase physical activity. Each exercise activity is thought to be equally effective, but these activities have yet to be quantitatively evaluated. Additionally, the programs are thought to be just as effective as similar exercise programs used around the world; however, Grenada's program is lacking measurement data to compare the effectiveness of its activities to others. To compare Grenada's exercise classes to each other and other programs around the world, participant intensity will be measured to quantify short-term program effectiveness.

Grenada's tri-island population is approximately 90,000 on the main island of Grenada, 4,600 in Carriacou, and 900 on Petite Martinique [4]. Carriacou has been noted to have a reactive approach to illness. It has been shown that the population of Carriacou attributes cardiovascular disease to genetics and generally seeks health advice after the onset of illness [4]. This reactive approach to illness proves troublesome for the current epidemiological transition Grenada is experiencing. The epidemiological transition will shift health burdens from predominantly childhood infectious diseases to adult chronic diseases [7]. As of 2008, mortality from noncommunicable diseases was 6.7 times greater than mortality from communicable diseases in Grenada [12]. Grenada's changing population pyramids reflect this epidemiological

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transition to increasing life expectancy and an aging population [9]. As health burdens shift from infectious to chronic diseases, Carriacou's reactive approach to health will not be as effective as a preventative approach to illness. A preventive program to reduce future chronic diseases would not only positively impact Carriacou's population but all of Grenada as well.

The main island of Grenada has already started this preventative approach by influencing adults and children to increase their physical activity. Exercise reduces risk factors for chronic diseases such as diabetes and cardiovascular disease. Comprehensive reviews describe lifestyle changes of increased exercise as highly effective ways to control body weight and reverse some effects of type II diabetes mellitus [3]. Additionally, physical activity not only lowers blood pressure and reduces the risk of hypertension in adults and children, but it also reduces cholesterol levels [5, 11]. With diabetes on the rise and hypertension linked to 18% of all deaths in Grenada, the population of Grenada can benefit from the preventative effects of exercise [8]. In 2007 the Pan American Health Organization cited vascular diseases as the leading cause of death in Grenada [8]. Fortunately, exercise is shown to improve many vascular and heart diseases. Decreased sedentary lifestyle through increased exercise will reduce the prevalence and severity of many chronic diseases plaguing Grenada.

To increase physical activity in Grenada to combat chronic disease, the government allowed exercise training camps to be run by the Royal Grenadian Police Force Special Service Unit, RGPF-SSU. The training camps attract participants by offering different exercise courses at varying degrees of intensity. These camps offer a beneficial public service to the Grenadian community by providing a safe and encouraging workout atmosphere, yet the program lacks empirical data to prove its effectiveness. Similarly, expressing differences among the beginner, intermediate, and advanced levels will be more exact using tangible data instead of subjective qualitative expressions. The lack of performance measurements also limits the SSU training camps from being compared to other established exercise programs such as the Curves™ program in the United States [6].

To address these questions and to evaluate the program, participant effort would need to be measured. The preferred method of measuring participant effort is to measure the amount of movement by each participant using accelerometers. Individual results can be converted into Metabolic Equivalents (METs), which allows different exercise styles to be quantitatively compared. Additionally, by measuring the program in METs, Grenada can compare its program to other programs around the world. Evidence of producing higher METs outputs in the SSU program compared with established exercise programs can lead to program credibility and can hence serve as motivation for participants to continue attending the SSU program. Additionally, a comparison that favors these SSU training camps would assist with establishing additional training camps across the country.

Methods

Study Description

This study was a cross-sectional evaluation of the Sports for Health program run by Windward Research and Education Foundation (WINDREF) to determine the intensity of the exercise program used. Grenada's Sports for Health program offers dance, aerobics, and jogging exercises which are further stratified into beginner, intermediate, and advanced courses for participants assigned to separate and corresponding levels of exercise intensity. Grenada's Sports for Health had 167 participants enrolled in its RGPF-SSU training camp at Point Saline in January 2012. Data was collected in January and February 2012 during a participant's performance in a course. To find differences or similarities between exercise programs, the analysis used Metabolic Equivalents to standardize comparisons. Additionally, the METs averages helped determine how Grenada's SSU training camps compared to other programs.

Design

The study site is located at the RGPF-SSU training camp in Point Saline. The study population consists of participants enrolled in the Sports for Health program. Gender was controlled by only including females in analysis as 99% of participants in the Sports for Health program are females. Only participants above the age of 18 (eighteen) years old were measured and all participants consisted of Grenadian residents. The study collected data from individuals as they completed a single program per day. The type of exercise program chosen each day was already determined by the instructors prior to the beginning of the study. Analysis was stratified into three groups based on participants' level of exercise as beginner, intermediate, or advanced. Body Mass Index (BMI) was calculated from previously acquired measurements conducted by scientists in the Sports for Health program. New participants enrolled in the study had their BMI measured. BMI was controlled for during the METs calculations using equations from ActiGraph.

Selection and enrollment

Seven to fourteen participants participated per session. This number fluctuated based on attendance and willingness to participate. Three measurement sessions occurred per week for three weeks. As participants arrive, every person was offered a chance to participate. If they were interested, consent was administered. Participants also were required to be actively enrolled in the Sports for Health program for a minimum of one year.

A participant's level of beginner, intermediate, or advanced activity was determined by instructors within the Sports for Health program. Upon joining the training camp, participants were required to start their performance in the beginner classes where they were judged on performance. Participants are promoted to the next level of physical activity after the instructor's evaluation to be ready for an increase in exercise intensity. A change in level of activity retained the type of exercise activity but was accompanied with a change in intensity. All participants during the two months of this study remained in their respective level of exercise intensity during the period of observation.

Data

Once enrolled in the study, an accelerometer attached to an elastic cord was placed around the participant's upper left arm by researchers of the same gender when available. The "GT3X Activity Monitor" three-axis accelerometers by Actigraph were used

during the study which were handled according to directions given by the ActiLife manual on page 16 [2]. Data collection passively continued from the start of placement until the removal of the accelerometer. Placement and removal of the accelerometer coincided with the beginning of an exercise program and the end of the hour-long exercise program respectively. Data was downloaded into a central electronic database that was stored on a portable laptop computer. Additional data being collected described the specific conditions that could possibly influence a participant's movement that day such as weather conditions and location. The METs for each individual were calculated using ActiGraph equations provided by the ActiGraph operating manual displayed in Table 1 [1]. Data that was used in the METs calculations was intended to reflect the data in the middle of the workout that excludes warm-up and cool-down phases. To accomplish this, average intensity levels were calculated from the middle 50 percent of data for each person that was analyzed. The middle 50 percent is denoted as the time stamped from minutes 15 to 45 in each session. Time was standardized by using the same average number of "Counts" from the hour long sessions in the Actigraph equations for each participant.

Multiple Comparative tests were performed to identify specific differences in METs between different exercises and intensity levels. P-values were calculated and significance was assessed at an alpha of 0.05. Simple comparisons were made between METs outputs from each exercise and established workout activities displayed in Table 2. All calculations occurred in Microsoft Excel 2007 and ActiLife 5 [2].

Results

The SSU dance class induced more participant effort than both the SSU jogging and SSU aerobics classes (Table 1, 2).

While the SSU jogging and aerobics classes produced lower METs in participants than the dance class, all SSU classes still produced METs outputs comparable to previously recorded exercises as shown in Table 3.

The results provide evidence of both the Advanced and Intermediate groups producing more METs than the Beginner group as shown in Table 4.

The comparison analysis was conducted across the different levels of exercise intensity available in the Sports for Health program. The intermediate and advanced levels of intensity produced more METs than the beginner level which was consistent with the comparative METs averages from Table 5.

Discussion

While the dance class induces great METs outputs than the other classes, all classes produce substantial METs outputs. The SSU courses produced METs values similar to previously recorded METs values of comparable exercises. Specifically, when compared an established weight control exercise program such as Curves™, every SSU class induced greater participant effort as reflected in the greater METs values [6]. Overall, the METs outputs from all SSU classes are classified as moderate to hard intensity workouts by the ActiGraph's Research Division [10]. The results provide evidence that the Advanced and Intermediate level exercises both induce higher METs averages than the Beginner level exercises.

Limitations of this study arose during the selection process. A possible pattern could have arisen when participants agreed or volunteered to join the study. If the inclusion of volunteers did create a pattern, the results would not be as generalizable. This inclusion process did not allow the analysis to be fully balanced when comparing intensity levels of the Advanced, Intermediate, and Beginner groups. Limitations in analysis arose when participant weight was unknown. To correct for this, the average group weight was used for an unknown individual. A participant at the high or low end of the weight classes could differ from the average by 30kg. Even if the participant with the unknown weight had a difference of 30kg from the average when the average was used, the largest approximate variation in her METs value would only be ±0.093 METs for that individual.

Conclusion

Attending any SSU exercise class will produce about 6 (six) METs which reflects moderate to hard exercises. These METs imply kilocalories will be burned by participants at levels similar to other moderate to hard exercises such as jogging, running at 4 miles per hour, light stationary rowing, and stationary cycling. The authors recognize that participants attending any workout can produce METs at a level reflective of inducing positive health benefits.

Evidence suggests that if participants wish to increase their Metabolic Equivalents output, they should attend Advanced or Intermediate courses instead of Beginner courses. Additionally,

Table 1. METS for Aerobics, Jogging and Dance.

	Aerobics (n=22)	Jogging (n=25)	Dance (n=28)
Average METs	6.24 ± 0.41	6.31 ± 0.46	6.52 ± 0.29

Table 2. Comparison among Aerobics, Jogging and Dance.

Comparison Groups	p-value	Interpretation
Aerobics : Jogging	0.58	Jogging and Aerobics classes elicit similar METs
Dance : Aerobics	< 0.01	Dance class elicits significantly more METs than Aerobics class
Dance : Jogging	0.056	Dance class has evidence of eliciting more METs than Jogging class

Table 3 (6). Comparative METs averages.

Exercise Type	Description	METs averages
Aerobics	Curves™ exercise routines in women	3.5
	SSU Aerobics Class	6.24 ± 0.41
	Rope skipping, general	11.0
Jogging	Jog/walk combination or running 4 mph	6.0
	SSU Jogging Class	6.31 ± 0.46
	Jogging, general	7.0
Dance	Caribbean dance (Abakua, Beguine, Bellair, Bongo, Brukin's, Caribbean Quadrills, ect.)	3.5
	SSU Dance Class	6.52 ± 0.29
	Ballet, modern, or jazz performances	6.8

Table 4. METs for different Intensity of Exercise.

	Beginner (n=5)	Intermediate (n=12)	Advanced (n=10)
Average METs	6.12 ± 0.38	6.49 ± 0.39	6.51 ± 0.47

Table 5. Physical indicators of participants.

Number of Participants	167
Height (cm)	164 ± 9
Weight (kg)	80.9 ± 14.9
BMI	30.3 ± 7.1
Waist (cm)	91.2 ± 12.6
Hip (cm)	106.4 ± 11.8
Waist:Hip Ratio (WHR)	0.86 ± 0.07

the Grenadian SSU program produced more METs than American programs such as Curves™. Performing better than proven weight loss programs gives credibility to the effective design of the SSU workout program.

The positive results from this study are aimed to influence exercise physiology in Grenada by motivating new participants to join the SSU program and by motivating current participants to increase their intensity level. The program gets people moving at a moderate-vigorous intensity for at least 30 minutes per session.

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