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Original Research Article

The Energy Expenditure and Relative Exercise Intensity of BODYJAM

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Abstract

Introduction: BODYJAM is a relatively new form of aerobic dance that combines hip hop dance moves with the latest trending music. It is unique in that it progressively “layers” dance movements so that participants can regulate exercise intensity to their individual ability. **Purpose:** To determine the energy expenditure and relative exercise intensity during a BODYJAM class. **Methods:** Nineteen female (age 20.1 ± 1.14 years) subjects completed a maximal treadmill test and a 55-minute BODYJAM session. Heart rate and RPE were recorded throughout the BODYJAM session. The HRs that were recorded during the workout were inserted into individual HR/ VO_2 regression equations, developed from the treadmill test, to estimate VO_2 and energy expenditure. **Results:** It was found that subjects exercised at an average of $73 \pm 3.5\%$ of %HRmax and $52 \pm 6.6\%$ of % VO_2 max. Energy expenditure averaged 393 ± 86.4 kcal/session and RPE during the workout averaged 11.5 ± 1.91 . **Conclusion:** The BODYJAM session meets the standards set forth by ACSM to improve cardiorespiratory fitness and body composition and provides an upbeat alternative to traditional aerobic exercise modalities.

Key Words: Cardiorespiratory Fitness, Les Mills, Training.

Introduction

In 1969, Jacki Sorensen was asked to create a fitness program for Air Force wives at a military base in Puerto Rico¹. Jacki developed a fitness routine based on her own regimen which entailed the combination of aerobic exercise and dance. She created the concept of “aerobic dancing” by merging choreographed routines to upbeat music.

Over the years, many studies have been completed to evaluate the physiological

responses to aerobic dance. Foster² evaluated four female subjects who performed an aerobic dance routine while oxygen consumption (VO_2) was monitored. It was found that the subjects exercised at an average of 77% of estimated VO_2 max during the routine. It was concluded that aerobic dance could improve cardiorespiratory fitness and was a viable option for individuals looking for an alternative to traditional exercise training.

Milburn and Butts³ compared the training responses to aerobic dance and jogging in 46 untrained female subjects. The subjects were divided into three groups: dancers, joggers, and control (who participated in bowling). Both the jogging and aerobic dance groups exercised for 30 min/day, 4 days/week, for 7 weeks while heart rates (HRs) were recorded. It was found that the relative VO_2max of dancers increased by 10.2% and the joggers increased by 8.2%. This data suggested that both jogging and aerobic dance could increase cardiorespiratory fitness to a similar degree if performed at the same frequency, duration, and intensity.

Martin, Price and Butts⁴ evaluated the changes in cardiorespiratory fitness and body composition consequent to a 7-week Jazzercise program. Twenty-one females participated in 50-minute classes, which were held either 2 or 3 days per week. Subjects in both groups worked at an average of ~78% of HRmax. The 2-day per week group increased VO_2max by an average of 7.5% and the 3-day per week group increased VO_2max by an average of 6%. In terms of body composition, the 2-day group had a 7% reduction in percent body fat and the 3-day group experienced a 3.4% reduction. It was concluded that Jazzercise can elicit improvements in cardiovascular fitness and body composition when completed two or three times per week.

Rixon, Rehor, and Bemben⁵ compared energy expenditure between Bodycombat (Taebo), RPM (spinning), step aerobics, and Pump aerobic dance. Twenty-eight female subjects participated in one session of each of the four different classes while HR was continuously monitored. It was found that subjects exercised

between 60%-74% of HRmax and expended 8.0-9.9 kcal/min for the various classes. It was concluded all four classes could provide an attractive form of cardiovascular training that was comparable to jogging at ~ 5.0 mph.

Petrofsky et al.⁶ studied the effects of a 10-day aerobic dance and diet program on cardiovascular fitness, body composition, and weight loss in women. Subjects completed a 1-hour aerobic dance video every day for 10 days and followed a caloric-restrictive diet. After the 10-day program, subjects lost an average of 1.78 kg, reduced systolic blood pressure by 4 mmHg and diastolic blood pressure by 6 mmHg, reduced resting HR by 14 bpm, and showed an average reduction in waist girth of 3.7 cm. These results suggest that the combination of aerobic dance and a caloric-restrictive diet can improve cardiovascular fitness and body composition.

A more recent form of aerobic dance is QiDance, which utilizes pre-choreographed routines covering many genres of dance. Buermann, Porcari, Gillette, and Foster⁷ investigated the physiological responses to QiDance and found that subjects exercised at an average of 83% of HRmax and 69% of VO_2max . Subjects exercised at an average workload of 8.1 metabolic equivalents (METs) and burned an average of 498 kilocalories (kcal) per hour. It was concluded that QiDance can provide a vigorous workout based on American College of Sports Medicine (ACSM) guidelines⁸.

Another form of aerobic dance class is Zumba[®]. Zumba[®] is a Latin dance workout that is designed to give participants the feel of a dance

party. Luetgen, Foster, Doberstein, Mikat, and Porcari⁹ evaluated the physiological responses to a Zumba[®] class. It was found that subjects exercised at an average of 79% of HRmax, 66% of VO₂max, and expended ~570 kcal per hour. Subjects exercised at an average of 8.8 METs, which categorized Zumba[®] as vigorous intensity exercise based on ACSM guidelines.

Similar to many of these newer dance classes, BODYJAM by Les Mills¹⁰ offers a combination of hip hop dance moves synchronized to the latest music. BODYJAM is taught by layering moves in order for individuals to adjust intensity as they feel appropriate. To our knowledge there is no research evaluating the energy expenditure (EE) or relative exercise intensity of BODYJAM. The purpose of this study was to determine the relative exercise intensity and EE of a BODYJAM class relative to ACSM guidelines⁸. ACSM recommends that an individual should exercise between 64-95% of HRmax or 46-90% of VO₂max in order to improve cardiorespiratory endurance. Exercise intensity is often classified based on absolute METs. Light-intensity physical activity is defined as being 2.0-2.9 METs, moderate-intensity ranges from 3.0-5.9 METs, and activities requiring ≥ 6.0 METs are considered vigorous. In terms of EE, it is recommended that individuals expend 1,200-2,000 kcal per week (240-400 kcal per exercise session) in order to positively affect body composition¹¹.

Methods

Participants

Subjects for this study included 19 apparently healthy, college-aged females (18-22 years of age) recruited from the University of Wisconsin-La Crosse. All of the subjects had participated in

aerobic dance classes previously so they were familiar with the basic format of the workout. Initially, each subject completed the PAR-Q to screen for cardiovascular and orthopedic limitations to exercise and eligible subjects then had the study explained to them, were given the opportunity to ask questions, and provided written informed consent. The study was approved by the University of Wisconsin-La Crosse Institutional Review Board for the Protection of Human Subjects.

Procedures

Each subject performed a maximal graded exercise test on a treadmill utilizing a modified Balke protocol to determine HRmax and VO₂max. Subjects walked or ran at a self-selected pace and started the test at 0% grade. Treadmill speed remained constant throughout the test while the incline increased 2.5% every 2 minutes until volitional exhaustion. Throughout the test HR was recorded every minute using a Polar HR monitor (Polar Electro, Kempele, Finland) and respiratory gas exchange was measured continuously using a metabolic cart (Moxus Modular Metabolic System, AEI Technologies, Naperville, IL). Maximal HR was defined as the highest HR observed at any point in the test and VO₂max was defined as the highest continuous 30-second value for VO₂ that was seen during the test. Prior to each test, the metabolic system was calibrated with gases of known concentrations (15.98% O₂, 4.12% CO₂) and with room air (20.94% O₂ and 0.03% CO₂) as per the manufacturer guidelines. Calibration of the pneumotachometer was completed using a 3 liter calibration syringe. Rating of perceived exertion (RPE) was recorded every 2 minutes and at maximal exertion using the 6-20 Borg scale¹². Additionally, individual HR/VO₂

regression equations were developed using the HR and VO_2 responses during the last 30 seconds of each stage of the incremental treadmill test. These regression equations were then used to predict VO_2 based on the HR responses during the BODYJAM workout.

Each subject practiced the BODYJAM session at least three times in order to become familiar with the BODYJAM workout. Once deemed proficient by the primary investigator, each subject completed a 55-minute BODYJAM session by following along to a pre-recorded BODYJAM workout video. Each dance session included at least four subjects exercising together in order to achieve the “group effect” that Les Mills is known for in their classes¹⁰. Each session included approximately a 5-minute warm-up and cool-down. After the warm-up, the instructor introduced various dance combinations which is known as the “rehearsal phase.” The combinations began with basic steps. Layering was then incorporated by starting with a base move, then adding various upper and lower body movements. After all the dance combinations were taught, the class performed a double time “bust out performance.” Throughout the workout HRs were recorded continuously with a Polar HR

monitor and RPE was assessed after the warm-up, every 3-5 minutes during the “bust out performance,” and after the cool-down using the 6-20 Borg scale. Heart rates at each minute during the BODYJAM exercise session were inserted into the individual HR/ VO_2 regression equations to estimate VO_2 . Energy expenditure was calculated from the predicted VO_2 data assuming a constant of 5 kcal per liter of O_2 consumed per minute.

Statistical analyses

Standard descriptive statistics were used to characterize the subjects (age, height, weight, HRmax, VO_{2max}) as well as to summarize exercise intensity, energy expenditure, and RPE during the BODYJAM session. All data are represented as mean \pm standard deviation. Data were analyzed using SPSS version 25.0 (Chicago, IL).

Results

All 19 subjects completed the VO_{2max} treadmill test as well as the 55-minute BODYJAM session. Descriptive characteristics of the 19 subjects who participated in the study are presented in Table 1.

Table 1. Descriptive characteristics of the subjects (N=19).

Parameter	Mean \pm SD	Range
Age (yr)	20.1 \pm 1.14	18 - 22
Height (cm)	64.8 \pm 2.97	59 - 70
Weight (kg)	64.6 \pm 7.94	50.0 - 80.6
HRmax (bpm)	189.8 \pm 6.90	174 - 204
VO_{2max} (ml/kg/min)	43.0 \pm 4.18	34.7 - 49.4

The HR and % HRmax responses to the 55-minute BODYJAM session are presented in Figures 1 and 2, respectively. The average HR and %HRmax were 139 ± 6.59 bpm and $73 \pm 3.5\%$, respectively. Average predicted VO_2 and % VO_2max responses during the BODYJAM session are presented in Figures 3 and 4, respectively. The average predicted VO_2 and % VO_2max during the session were 22.3 ± 2.81 ml/kg/min and $52 \pm 6.6\%$, respectively. The VO_2 corresponded to an average of 6.4 ± 0.80 METs.

The average energy expenditure was 7.1 ± 1.57 kcal/min and the number of calories expended during the 55-minute workout averaged 393 ± 86.4 kcals. Average RPE values at the end of each segment throughout the BODYJAM session are presented in Figure 5. The average RPE for the entire BODYJAM class was 11.1 ± 1.36 . Excluding the warm-up and cool-down, the average for the 55-minute workout portion of the class was 11.5 ± 1.91 .

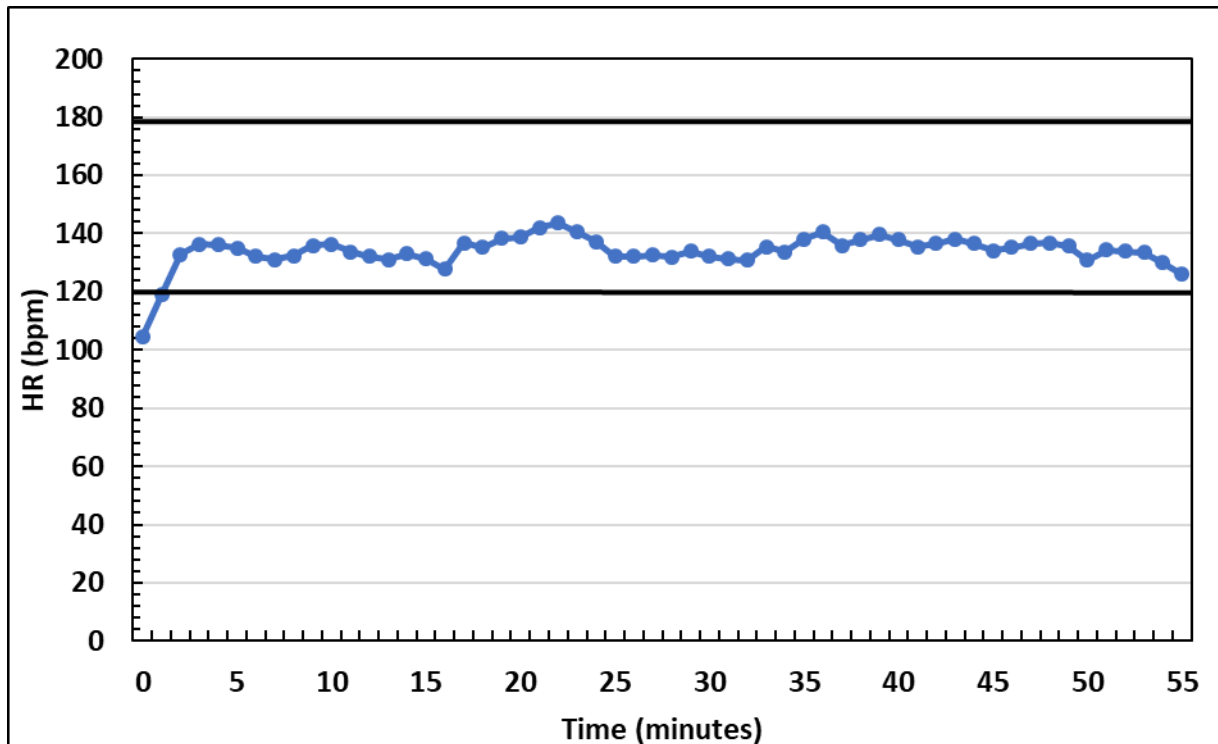


Figure 1. Average minute-by-minute HR responses to the BODYJAM session.

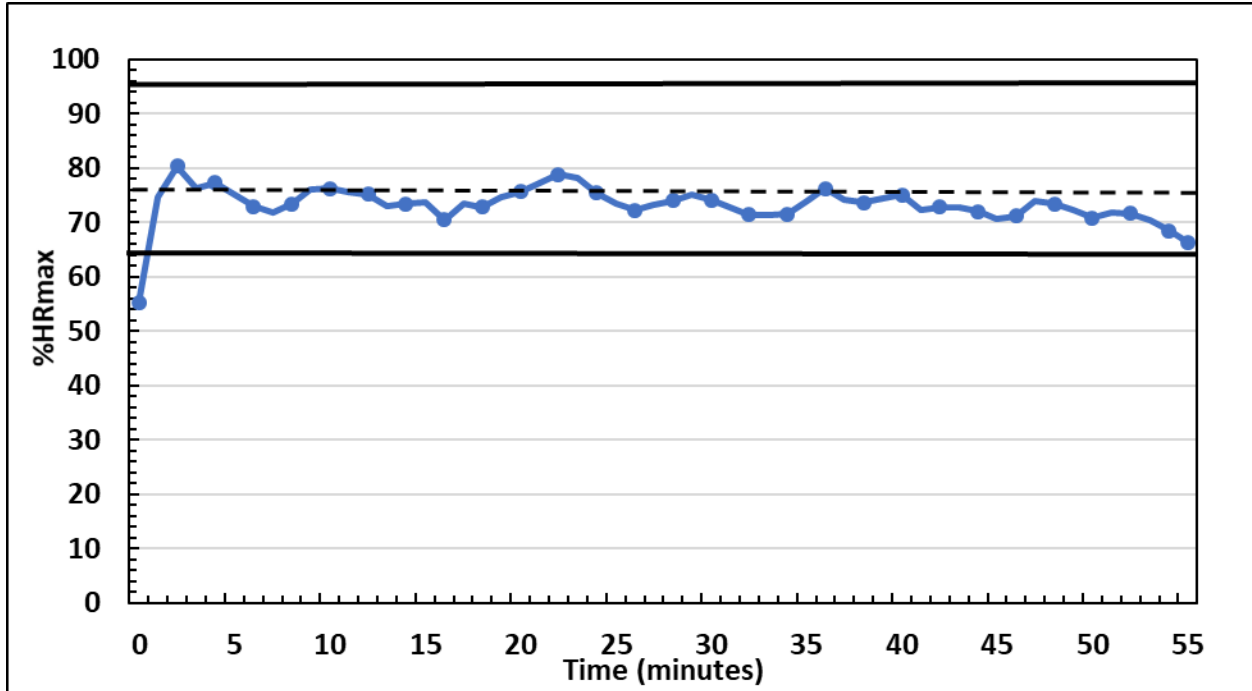


Figure 2. Minute-by-minute relative HR responses (%HRmax) to the BODYJAM session. ACSM guidelines recommend exercising between 64%-95% of HRmax which is represented by the boxed area on the graph. The separation between moderate and vigorous intensity ranges within the guidelines is represented by the dotted line.

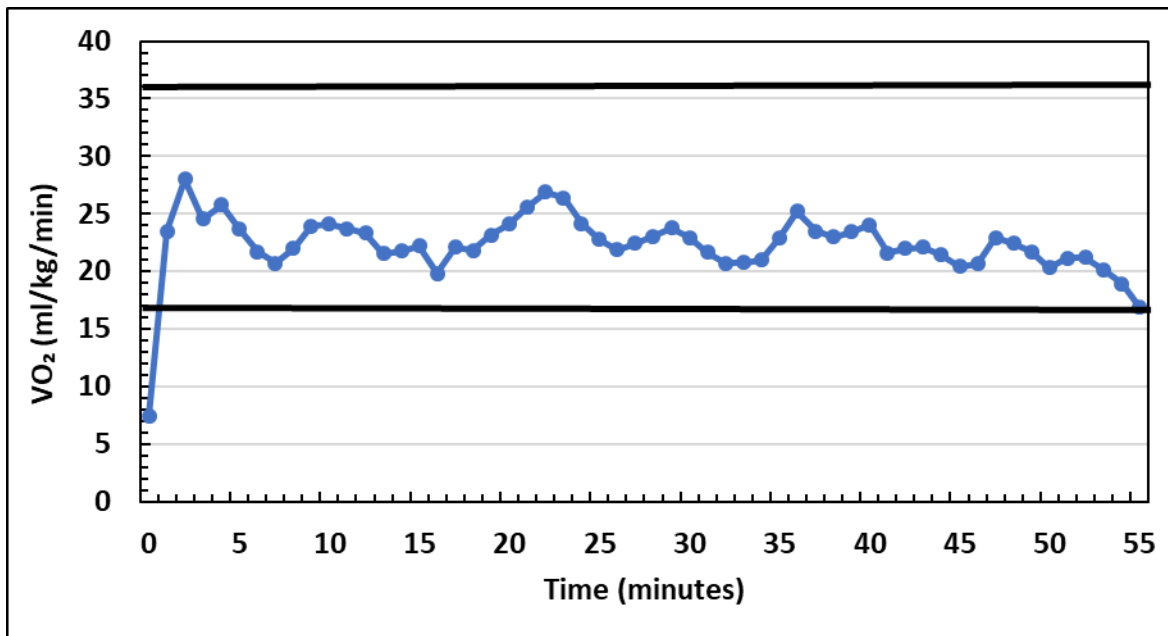


Figure 3. Average minute-by-minute VO₂ responses to the BODYJAM session.

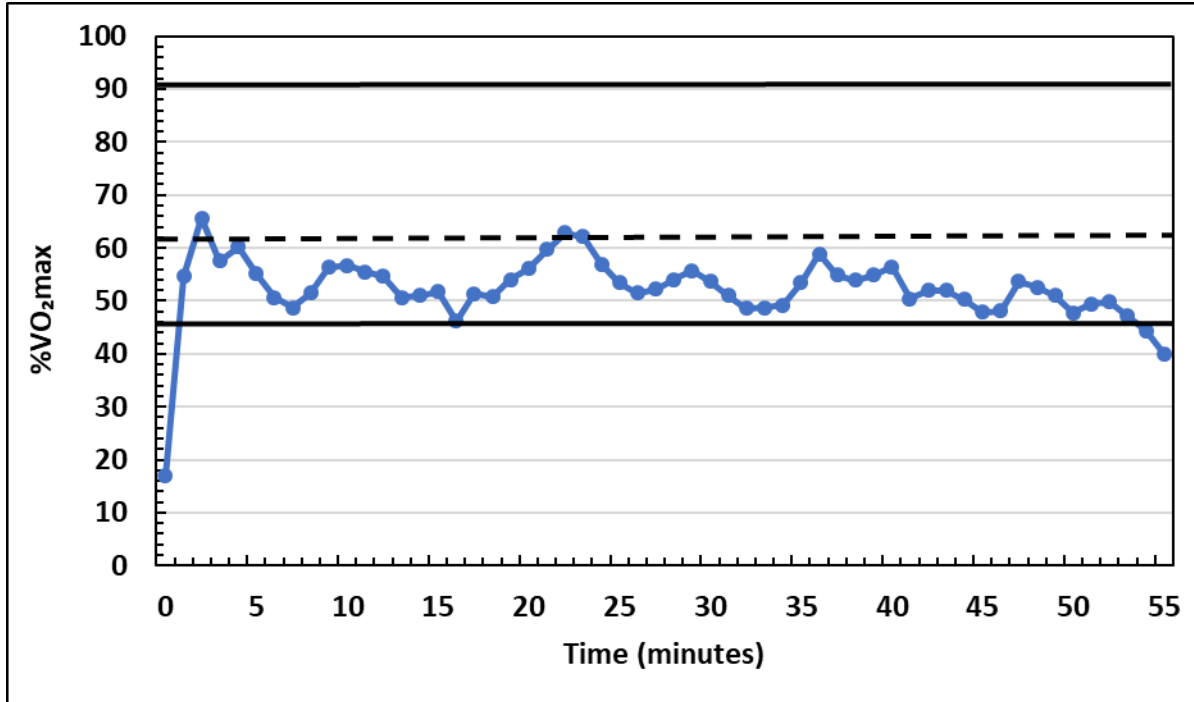


Figure 4. Minute-by-minute relative VO₂ responses (%VO₂max) to the BODYJAM session. ACSM guidelines recommend exercising between 46%–90% of VO₂max, which is represented by the boxed area on the graph. The separation between moderate and vigorous intensity ranges within the guidelines is represented by the dotted line.

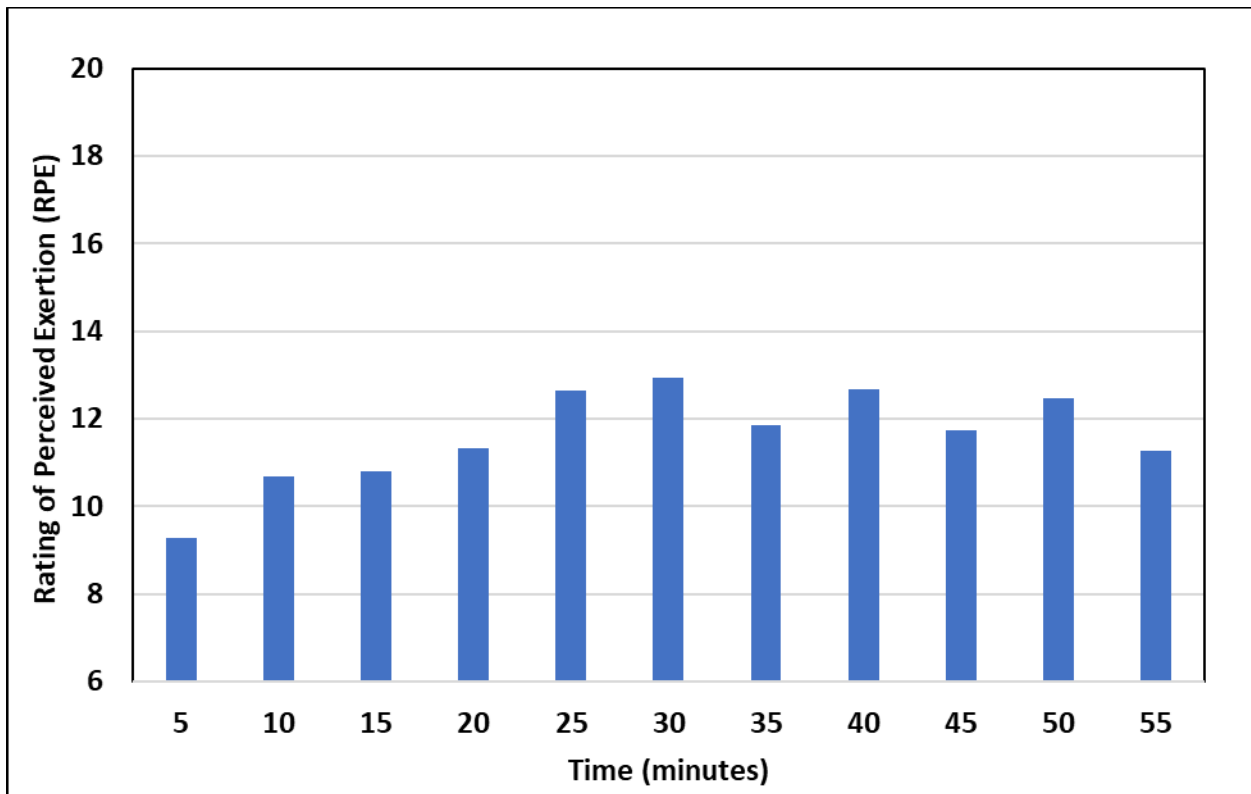


Figure 5. Rating of perceived exertion (RPE) responses to the BODYJAM session.

Discussion

The purpose of this study was to determine the relative exercise intensity and EE of a BODYJAM class relative to ACSM guidelines. ACSM recommends that an individual should exercise between 64-95% of HRmax or 46-90% of VO₂max in order to improve cardiorespiratory endurance. The current study found that subjects were exercising at an average of 73% of HRmax and 52% of VO₂max which would be within moderate intensity range (64–76% of HRmax and 46–63% VO₂max).

In terms of EE, it is recommended that individuals expend 1,200-2,000 kcal per week (240-400 kcal per exercise session) in order to positively affect body composition¹¹. Subjects in the study expended an average of 393 kcal during the 55-minute class. This indicates that BODYJAM could be used as an effective workout for weight management. This is especially important for individuals who are looking for a viable alternative option to traditional exercise training.

Comparisons between different workouts can be made using METs. Light-intensity physical activity is defined as being 2.0-2.9 METs, moderate-intensity ranges from 3.0-5.9 METs, and activities requiring ≥ 6.0 METs are considered vigorous⁸. In the current study, the average MET requirement was 6.4 ± 0.80 METs, which falls within the vigorous-intensity category. This is a disagreement with the %HRmax and %VO₂max data which both fell into the moderate intensity range and the RPE data which would rank the subjective intensity as “fairly light.” These discrepancies are most likely due to the relative fitness level of the subjects in the current study, who fell into the “good” fitness category based

on published norms⁸. When the average workout VO₂ (22.3 ml/kg/min) was divided by average VO₂max (43.0 ml/kg/min), the calculated relative VO₂ (%VO₂max) was only 52%, despite the fact that subjects were working at 6.4 METs. Also, because there were frequent teaching/free styling breaks throughout the video, this could have reduced the overall intensity of the workout. Other activities that are of similar intensity include walking at 4.0 mph on level ground (5.0 METs)¹³, hula-hooping (5.9 METs)¹⁴, TRX Suspension Training (5.8 METs)¹⁵, stand-up paddle boarding at an easy pace (6.3 METs)¹⁶, Pound[®] (5.1 METs) (Ryskey et al., 2017)¹⁷, and Aqua-Cycling (5.8 METs) (Johnson et al., 2018)¹⁸.

Possible limitations of the current study include the fact that subjects performed this work out on a pre-recorded BODYJAM workout video without a live instructor. Therefore, observed responses could possibly represent a conservative estimate of the exercise intensity of a typical BODYJAM class. Another limitation to this study included the inability to directly measure VO₂ during the BODYJAM workout. It was felt wearing the portable equipment would have inhibited the subject’s ability to fully perform the choreographed workout, decreasing the intensity of the workout. A final limitation was the different levels of skill each participant possessed. Even though each subject practiced the dance session on three separate occasions, some subjects were more skilled than others, which could have affected physiological responses during the final dance session.

To our knowledge, this is the first research project to be conducted on BODYJAM evaluating relative intensity and EE. Future

research could be conducted to evaluate the cardiorespiratory responses and relative exercise intensity of BODYJAM in other populations such as males or an older population.

Conclusions

In summary, BODYJAM meets ACSM intensity guidelines for exercise prescription and would be considered an effective workout for improving cardiorespiratory fitness, as well as providing weight loss and weight maintenance benefits. Thus, it could be a viable option for individuals looking for an alternative to traditional aerobic exercise training.

Disclosures

This study was funded by the American Council on Exercise (ACE). However, ACE was not involved in the design of this study, collection or analysis of the data, or the preparation of this manuscript.

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