THE PHYSIOLOGICAL EFFECTS OF PARTICIPATING IN A 40-MINUTE ZUMBA® FITNESS SESSION

A Manuscript Style Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science in Clinical Exercise Physiology

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College of Science and Health

December, 2011
THE PHYSIOLOGICAL EFFECTS OF PARTICIPATING IN A 40-MINUTE ZUMBA®
FITNESS SESSION

By Mary L. Luettgen

We recommend acceptance of this thesis in partial fulfillment of the candidate's requirements for the degree of Master of Science in Clinical Exercise Physiology.

The candidate has completed the oral defense of the thesis.

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ABSTRACT

Luetten, M.L. The physiological effects of participating in a 40-minute Zumba® fitness session. MS in Clinical Exercise Physiology, December 2011, 52 pp. (C. Foster)

The purpose of this study was to determine the physiological effects of participating in a 40-minute Zumba® fitness session. Nineteen apparently healthy subjects were recruited from the University of Wisconsin-La Crosse to determine the exercise intensity and energy expenditure of the session. The subjects ranged from 18-22 years old, and were experienced at participating in Zumba® fitness classes. The subjects performed a maximal graded exercise test on a treadmill to determine metabolic responses including VO₂ and HR. A linear regression line from the graded exercise treadmill test was computed to determine VO₂ (ml/kg/min) during the Zumba® fitness session. After the treadmill test, subjects participated in a single Zumba® fitness class. Subjects wore a radiotelemetric heart rate monitor during the Zumba® fitness class. Watches were downloaded to gather HR responses during the class. HR zones were determined for each subject using data gathered during the treadmill test based on HR at VT and RCT. Results for the study showed that throughout the exercise session, subjects were exercising at an estimated 63.5 ± 10.5% VO₂ max or 63-69 ±10.5% VO₂ reserve and 79 ± 7.0% HRmax or 117 ± 10.5% HRR, which is probably sufficient to increase aerobic capacity. The average energy expenditure was 9.45 ± 2.69 kcal/min representing 378 ± 108 kcal per 40 minutes of participating in a Zumba® fitness class. Based on these results, Zumba® was shown to meet the recommended guidelines from ACSM for improving cardiovascular fitness and improving and/or maintaining body weight.
ACKNOWLEDGEMENTS

I would first like to thank Dr. Carl Foster for being my undergraduate and graduate academic advisor and thesis chairperson. Without his mentoring and faith in me, I would not be standing where I am today. His dedication and willingness to help has guided me through my five years here at UW-La Crosse. Because of Dr. Foster, I have accomplished all of my undergraduate and graduate goals. I cannot express my gratitude enough. Thank you.

I would also like to thank the admittance committee for selecting me to be a graduate student in the Clinical Exercise Physiology program here at UW-La Crosse. I only applied to one graduate school because I knew that UW-La Crosse was the leader in the exercise physiology field. Thank you for giving me the privilege to represent the UW-La Crosse Clinical Exercise Physiology name proudly.

I would also like to recognize the following people who have directly assisted in helping with the completion and execution of my thesis study:

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My family, boyfriend, and friends, thank you. You are the best!
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INTRODUCTION

Every 25 seconds someone in America dies due to a coronary event in America. Consequently, the leading cause of death in America is heart disease (7). At least part of the deaths attributable to heart disease is related to sedentary living. The American College of Sports Medicine (ACSM) has published physical activity guidelines for Americans. ACSM recommends that healthy adults participate in moderate exercise 30 minutes a day, five days a week, or do vigorous exercise 20 minutes a day, 3 days a week in order to maintain health and reduce the risk for chronic diseases. ACSM recommends exercising at 40%/50% - 85% of VO₂ max or 64%/70%-94% of HRmax in order to improve and/or maintain cardiovascular fitness (6). There are many health benefits associated with regular physical activity and/or exercise including an improvement in cardiovascular and respiratory function, reduction in coronary heart disease risk factors, decreased morbidity, and mortality. Other associated benefits include decreases in anxiety, depression, risk of falls, enhanced physical function, feelings of well-being, and improved performance at work (1).

Obesity is a risk factor for heart disease and is a growing epidemic in our country. Because of this, Americans are seeking exercises that will both assist in weight loss and improve cardiovascular fitness. There are many forms of physical activity and/or exercise that have been used to meet these recommendations and achieve the associated benefits. ACSM identifies these activities as being dynamic, rhythmic physical activities that use large muscle groups (6).
Performing the same activities repeatedly may become boring, resulting in a loss of interest and adherence to exercise. Consequently, alternative activities have become an attractive means of exercising compared to traditional forms of exercise. In 1969 Jackie Sorenson created “aerobic dance.” Aerobic dance involves a series of choreographed dance steps and whole body movements such as walking, running, and skipping choreographed into a routine and put to music (5). Subsequent to the use of “aerobic dance,” there have been a large number of innovative activities developed and promoted as activities that will promote health and fitness.

Due to the rise of new fitness exercises and activities, researchers have become interested in determining whether new fitness trends meet the criteria recommended by the ACSM guidelines. The University of Wisconsin-La Crosse has recently studied the following forms of alternative exercise: Boot Camp, Hooping, Krankcycling, Kettlebells, Nia Technique, Power Yoga, and Advanced Pilates (2,8,9,10,12). In these studies the average exercise intensity and average energy expenditure were measured as markers of their suitability as alternative modes of exercise. All of the alternative exercises met the ACSM criteria for exercise intensity with the exception of the Nia Technique (2,8,9,10,12).

Recently, celebrity fitness trainer, Alberto “Beto” Perez, developed a variation of aerobic dance, “Zumba®”. This new exercise form was born in Cali, Columbia in the mid 90s (3). Beto began choreographing for his local artists and dancing in salsa clubs. He later became an instructor at the prestigious Maria Sanford Brazilian Dance Academy where he taught Salsa, Merengue, Rumba, Tap, Funk, Jazz, and Modern Dance. Beto later became a certified personal trainer and group exercise instructor. Zumba fitness®
was first introduced in one of Beto’s classes when he forgot to bring his traditional aerobics music. The only music he had were Latin music tapes in his car. He let the music motivate him, just as if he were in a club and began dancing to Salsa, Rumba, and Merengue. This was the start of the so called Latin fusion, Rumbacize (11). It quickly became the most popular class offered at his gym. In 1999 Beto brought Rumbacize to Miami, when he auditioned at Williams Island Spa. Two years later, two entrepreneurs, Alberto Aghion and Alberto Perlman, approached Beto. They convinced Beto to turn Rumbacize into a global company. Rumbacize changed its name to Zumba®, which in Spanish means, "buzz like a bee and move fast." Beto’s Rumbacize fitness approach is currently practiced in 35 countries, and led by over 13,000 certified Zumba® instructors worldwide (11). Zumba fitness® classes exhibit a party-like atmosphere with “no thinking” elements, while using music as the motivational ingredient. Zumba fitness® classes were designed for all types of people with various levels of fitness and coordination. Beto choreographs over 50 new songs each year in order to “help people look and feel great while dancing their cares away”(11). However, there has been little research done of physiological effects of participating in Zumba fitness® classes. Consistent with the pattern in University of Wisconsin-La Crosse’s laboratory of studying innovative forms of exercise, this study was designed to measure the average exercise intensity and energy expenditure while participating in Zumba fitness® classes.
METHODS

Subjects

Twenty apparently healthy female subjects were recruited from the University of Wisconsin-La Crosse. The subjects ranged from 18-22 years old; and were experienced at participating in Zumba fitness® classes. Participants in this study attended a Zumba fitness® class at the campus Recreational Eagle Center. Prior to participating in the research study, subjects completed the PAR-Q and provided written informed consent. Approval from the University of Wisconsin-La Crosse Institutional Review Board for the Protection of Human Subjects was obtained prior to the study.

Testing Procedures

Prior to testing subjects, pilot testing was done in three subjects to determine if the HR-VO₂ relationship during treadmill exercise would be representative of the HR-VO₂ relationship during Zumba®. The subjects performed a maximal graded exercise test on a treadmill to determine metabolic responses including VO₂ and HR. The test started at two mph and 1% grade. For the first six minutes the treadmill speed increased by one mph every two minutes. Treadmill grade increased to 4% and further increased by 0.5% every other two minutes. Treadmill speed increased by two mph during the stages where the grade was not increased. The test continued until the participants could no longer continue. Respiratory gas exchange was measured using open circuit spirometry (Moxus Modular Metabolic System, AEI Technologies, Naperville, IL). The ventilatory
threshold (VT) and respiratory compensation threshold (RCT) were determined using the V slope method. The Rating of Perceived Exertion (RPE) and HR were recorded every two minutes by means of the 0-10 Borg scale and radiotelemetry. The HR versus VO₂ relationship was established for each subject based on responses during the last 30 seconds of each stage during the incremental test. The subjects also performed a simulated Zumba fitness® class, using videos of easy, moderate, and hard routines, with the same VO₂ and HR monitoring. Responses of these three subjects, presented in Figure 1a-c, indicated that the treadmill HR-VO₂ relationship was comparable to the HR-VO₂ relationship during the simulated Zumba fitness® class. Accordingly, it was decided that for logistic simplicity the subjects in the primary study would perform a treadmill test in the laboratory to establish their HR-VO₂ relationship and that HR responses only would be measured during normal Zumba fitness® classes.

![Graph](image)

Figure 1a. HR-VO₂ Relationship between Treadmill and Zumba® for Subject 1
The subjects in the research study performed the same incremental treadmill maximal test to establish their individual HR-VO₂ relationship. Figure 2. represents a
sample subject’s linear regression line from the graded exercise treadmill test, which was used to determine \( \text{VO}_2 \) (ml/kg/min) during the Zumba fitness\textsuperscript{®} session. "X" in the equation was replaced with the HR during the Zumba fitness\textsuperscript{®} session to estimate each subject's \( \text{VO}_2 \) (ml/kg/min).

\[
y = 2.591x + 83.525
\]

\( R^2 = 0.9963 \)

![Figure 2. Graded Exercise Treadmill Linear Regression Line for Sample Subject](image)

After the treadmill test, participants participated in a single Zumba fitness\textsuperscript{®} session. Subjects wore a radiotelemetric heart rate monitor during the Zumba fitness\textsuperscript{®} class. Watches were downloaded to gather HR responses during the class. HR zones were determined for each subject using data gathered during the treadmill test based on HR at VT and RCT. Three HR zones were identified and computed for each subject. Zones included zone 1 (below VT), zone 2 (between VT and RCT), and zone 3 (above RCT). A TRIMP score was calculated by multiplying the time in each zone by the value of the
zone and summing (zone 1: 1, zone 2: 2, and zone 3: 3). This score is used as an indication of how hard an exercise session is compared to other sessions.

**Statistical Analysis**

Standard descriptive statistics were used to characterize the subjects and to calculate the energy expenditure and exercise intensity of participating in a Zumba fitness® class. Energy expenditure was calculated by assuming that a VO$_2$ of 1.0 L/min = 5 kcal/min.
RESULTS

During the Zumba fitness® session there was a heart rate monitor malfunction, so one subject’s data was eliminated from the study. Descriptive characteristics of the 19 subjects are presented in Table 1. The age range of the subjects was 18-22 years. Average physiological responses during the 40-minute Zumba fitness® session (excluding warm-up) are presented in Table 2. The average HR was 154 ± 14.1 bpm, which corresponds to 79.5 ± 7.0% of HRmax. Throughout the session, the average estimated VO₂ was 63.5 ± 10.5% of VO₂ max. The average estimated energy expenditure of participating in a Zumba fitness® session was 9.45 ± 2.69 kcal/min representing 378 ± 108 kcal per 40 minutes of participating in a Zumba fitness® class.
Table 1. Descriptive Characteristics of the Subject Sample (N = 19)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ± SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>19 ± 1.41</td>
<td>18-22</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>167.64 ± 7.44</td>
<td>152-175</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>61.8 ± 22.5</td>
<td>47-72</td>
</tr>
<tr>
<td>VO₂max (L/min)</td>
<td>2.96 ± 0.54</td>
<td>2.04-3.97</td>
</tr>
<tr>
<td>VO₂max (ml/kg/min)</td>
<td>47.2 ± 5.62</td>
<td>38.8-60.0</td>
</tr>
<tr>
<td>VT (ml/kg/min)</td>
<td>27.3 ± 5.25</td>
<td>19.7-35.0</td>
</tr>
<tr>
<td>RCT (ml/kg/min)</td>
<td>38.4 ± 5.02</td>
<td>27-46</td>
</tr>
<tr>
<td>HRVT (bpm)</td>
<td>140 ± 8.0</td>
<td>125-160</td>
</tr>
<tr>
<td>HRRTC (bpm)</td>
<td>175 ± 8.0</td>
<td>160-186</td>
</tr>
<tr>
<td>HRmax (bpm)</td>
<td>196 ± 7.0</td>
<td>180-202</td>
</tr>
</tbody>
</table>
Table 2. Exercise Response to 40-Minutes of Zumba®

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ± SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>x Workout Time</td>
<td>38.8 ± 4.89</td>
<td>32-52</td>
</tr>
<tr>
<td>x Workout HR</td>
<td>154 ± 14.1</td>
<td>127-177</td>
</tr>
<tr>
<td>% Workout HRmax</td>
<td>79.5 ± 7.0</td>
<td>65-89.1</td>
</tr>
<tr>
<td>x Workout VO₂</td>
<td>30.9 ± 6.19</td>
<td>21.2-42.1</td>
</tr>
<tr>
<td>% Workout VO₂ max</td>
<td>63.5 ± 10.5</td>
<td>39.7-82.2</td>
</tr>
<tr>
<td>x Workout kcal/min</td>
<td>9.45 ± 2.69</td>
<td>5.1-15.3</td>
</tr>
</tbody>
</table>

Table 3. represents the time and percentage of time spent in each of the three training zones. The data reveals that participants spent most of their time in zone 2 during the Zumba fitness® session (Zone 2 time = 21.0 ± 9.3 minutes; Zone 2 % time = 54.4 ± 23.7). A TRIMP score of 72.8 ± 17.9 was calculated for this study.

Table 3. Time in Each Training Zone

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time in Zone 1</td>
<td>11.3 ± 10.1</td>
</tr>
<tr>
<td>Time in Zone 2</td>
<td>21.0 ± 9.3</td>
</tr>
<tr>
<td>Time in Zone 3</td>
<td>6.5 ± 8.6</td>
</tr>
<tr>
<td>% Time in Zone 1</td>
<td>29.1 ± 25.3</td>
</tr>
<tr>
<td>% Time in Zone 2</td>
<td>54.4 ± 23.7</td>
</tr>
<tr>
<td>% Time in Zone 3</td>
<td>16.6 ± 22.1</td>
</tr>
<tr>
<td>TRIMP</td>
<td>72.8 ± 17.9</td>
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</tbody>
</table>
Figure 3. represents the average heart rate response of the subject with the highest and lowest VO₂ max during a Zumba fitness® session. The dashed line represents the average heart rate response of the sample population (154 ± 14.1).
Figure 4. represents the VO$_2$ response of the subject with the highest and lowest VO$_2$ max during a Zumba fitness® session. The dashed line represents the average VO$_2$ response of the sample population ($30.9 \pm 6.19$).

Figure 4. Average VO$_2$ Response in Sample Subjects
Figure 5. represents the percent VO$_2$ max of the subject with the highest and lowest VO$_2$ max during a Zumba fitness® session. The shaded portion indicates the ACSM Exercise Intensity Recommendations. By looking at the graph, it is clear that all of the subjects meet ACSM's criteria for exercise intensity.

Figure 5. Sample Subjects' Percent VO$_2$ Max Meet Criteria for ACSM Exercise Intensity
Figure 6. represents the percent HR max of the subject with the highest and lowest VO₂ max during a Zumba fitness® session. The shaded portion indicates the ACSM Exercise Intensity Recommendations. By looking at the graph, it is clear that all of the subjects meet ACSM’s criteria for exercise intensity.
DISCUSSION

ACSM’s recommendations for improving cardiovascular fitness are to exercise 40/50- 85% VO2max or 64%/70%-94% of HRmax. This study found that participating in 40 minutes of a Zumba fitness® session fell within these guidelines. During the study, subjects were exercising at an estimated 63.5 ± 10.5% VO2max or 79.5 ± 7.0% HRmax, which probably is sufficient to increase aerobic capacity. The subject’s descriptive characteristics revealed that there was a range of fitness levels (38.8-60 ml/kg/min), thus it was found that there was a wide variety of average exercise intensities (40-82% VO2max; 66-89% HRmax) attained by the subjects during the Zumba fitness® session. Even though the subjects had varying VO2 max values, all of the subjects met ACSM’s criteria for exercise intensity.

Figure 7. illustrates the subjects’ percent VO2 max during the session. The shaded portion indicates the ACSM Exercise Intensity Recommendations. By looking at the graph, it is clear that all of the subjects met ACSM’s criteria for exercise intensity.
Figure 7. Subjects’ Percent VO₂ Meet ACSM Criteria for Exercise Intensity

Figure 8. indicates that the sample population that was studied was a relatively fit population. The reference female VO₂ max for this age group is 35 ml/kg/min, while the range of VO₂ max was 38.8-60 ml/kg/min (1). This graph indicates that all fitness levels in the sample population were able to reach the recommended intensity for exercise intensity according to ACSM guidelines.
Several alternative forms of exercise have been researched regarding exercise intensity and energy expenditure. Figures 9 and 10 compare Zumba® to these alternative forms of exercise. The shaded portion indicates the ACSM Exercise Intensity Recommendations. Zumba® meets these guidelines.
Figure 9. Comparison of Percentage HR max of Alternative forms of Exercise
ACSM recommends Americans to burn 300 kcals/workout in order to promote weight loss and maintain a healthy body weight (1). This study found that participating in a 40-minute Zumba fitness® session could burn up to $9.45 \pm 2.69$ kcal/min representing $378 \pm 108$ kcal/40 minute session, which meets ACSM’s recommendations.
CONCLUSION

This study found that participating in a 40-minute Zumba fitness® session can burn an average of 378 calories. The subjects in this study were working at 79.5% of HRmax and 63.5% of VO₂ max, which meets ACSM’s guidelines for improving cardiovascular fitness and maintaining a healthy body weight.
REFERENCES


University of Wisconsin-La Crosse
Department of Exercise and Sport Science Informed Consent

The Physiological Effects of Participating in a 40-Minute ZUMBA® Fitness Session

Why have you been asked to take part in this research?
This study is measuring the energy expenditure, exercise intensity, and pattern of learning in ZUMBA®. You have been invited to participate in this study because you are enrolled in a biweekly ZUMBA® class at the University of Wisconsin-La Crosse. You were also chosen because you are a novice ZUMBA® participant between the ages of 18-40. Participating in this study is voluntary, and you may quit at any time. Please do not hesitate to ask questions about this consent form or the procedures if you do not understand something.

How many people will be in this study and how long will it last?
There will be approximately 20 people participating in this study. This study will last seven weeks, and your participation and time will be about 110 minutes a week, where you will be participating in your ZUMBA® class. Additionally, you will spend time in the Human Performance lab where you will perform a maximal treadmill test as well as three trial workouts, which should last no more than 45 minutes.

What will happen if you agree to be part of this study?
If you agree to be part of this study, you will exercise on four different occasions in addition to your biweekly ZUMBA® classes. During each biweekly ZUMBA® class, you will need to wear a heart rate monitor watch and chest strap to record heart rate data.
During the first week of the study, your maximal oxygen consumption will be measured during a treadmill max test. You will wear a scuba divers mouthpiece to measure how much you are breathing and a heart rate monitor to measure your heart rate. Additionally, there will be three video-recorded ZUMBA® workouts that you will participate in, where you will be wearing the same equipment as you do for the treadmill max test. This test will be done to determine if there is a learning pattern involved in participating in ZUMBA®.

What are the possible risks and discomforts from this study?
Similar to any form of exercise, you will get tired and you might experience some muscle soreness. However, these effects are only temporary. There is very low risk of serious injury or complications in healthy individuals.

How will you benefit from participating in this study?
After participating in the maximal treadmill test, you will have data that can explain your fitness level and efficiency in performing ZUMBA®. Additionally, you will help other researchers understand the physiological effects and pattern of learning ZUMBA®.
Do you have to participate?
Participation in this study is voluntary. You may stop participating at any point without penalty.

What are the costs of participating?
There are no costs for you to participate in this study.

What are your rights and confidentiality during this study?
All of the data will be kept confidential through the use of number codes. If this study is published or presented for scientists and teachers, your data will not be personally identifiable.

Questions regarding study procedures may be directed to Mary Luettgen (414-940-6345), the principal investigator, or her advisor Dr. Carl Foster (608-785-8687). Questions regarding the protection of human subjects may be addressed to the UW-La Crosse Institutional Review Board for the Protection of Human Subjects (608-785-8124).

Subject’s Understanding:
Have all your questions regarding how the research study might affect you been answered?

Yes / No (Circle one)

If you are interested in participating in this study, please sign your name. You will not be penalized or treated differently for not participating in this study.

Participant’s Name:________________________________________

Participant’s Signature:____________________________________ Date:________

Researcher’s Signature:____________________________________ Date:________
PAR-Q and YOU
(A Questionnaire for People Aged 15 to 69)

Some physical activity is fun and healthy, but for many people the idea of becoming physically active can be daunting. It is very easy for most people, however, to check with their doctor before they start doing any more physical activity.

If you are planning to become more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 to 69, the PAR-Q will only ask you whether you should see your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each question honestly.

**YES** to one or more questions

If you answer **YES** to one or more questions, you may want to discuss physical activity with your doctor before you start. You may also want to answer the PAR-Q again after 12 months if you have changed your activity level.

**NO** to all questions

If you answer **NO** to all questions, PAR-Q suggests that you can begin a physical activity program. Be sure to check with your doctor before you start doing more physical activity.

**DELAY BECOMING MUCH MORE ACTIVE**

- If you are not feeling well for any reason, or have any symptoms of illness, do not delay becoming more active.
- If you are feeling well, but you are not feeling better after doing more physical activity, you may want to consult with your doctor before you start becoming more active.

**PLEASE NOTE**

- If you have not been active for a long time, you may need to start more slowly.
- If you have been active for a long time, but you want to start doing more physical activity, you may want to consult with your doctor before you start.

The PAR-Q is a self-administered questionnaire. Your doctor or physiotherapist may ask you questions in a similar way, but you should always think through the questions and answer them honestly.

**NOTE**

This physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if your condition changes so that you would answer **YES** to any of the seven questions.

**27**
APPENDIX C
DATA SHEET
## Data Sheet

<table>
<thead>
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<th>Name:</th>
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<tr>
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MAX HR: ______

Weight: ______

Age: ______
REVIEW OF LITERATURE

Every 25 seconds someone will die due to a coronary event in America; consequently, the leading cause of death in America is heart disease (8). High levels of physical activity are thought to help prevent coronary events. The American College of Sports Medicine (ACSM) has published physical activity guidelines for Americans to follow. ACSM recommends healthy adults to participate in moderate cardiovascular exercise 30 minutes a day, five days a week, or do vigorous cardiovascular exercise 20 minutes a day, 3 days a week in order to maintain health and reduce the risk for chronic diseases. ACSM recommends participating in aerobic exercise at 40% - 85% of VO₂max or 64% - 94% of HRmax in order to improve and/or maintain cardiovascular fitness (7). Evidence indicates that regularly expending at least 1,000 kcals during physical activity/exercise per week results in health and fitness benefits (7). This equals out to exercising 150 min • wk⁻¹ or 30 min • day⁻¹. ACSM recommends adults to attain 10,000 steps or more a day as a goal of being physically active. Resulting benefits from the level of exercise include an improvement in cardiovascular and respiratory function, reduction in coronary artery disease risk factors, decreased morbidity, and mortality. Other associated benefits include a decrease in anxiety, depression, and risk of falls, as well as enhanced physical function, feelings of well-being, and improved performance at work (1).

Even though there are guidelines for Americans to follow that are published for physical activity, obesity is a growing epidemic in our country and is a leading
contributor to several chronic diseases (heart disease, diabetes, cancer, etc.).

Recent estimates indicate that 32% of adults are obese (BMI of ≥ 30 kg·m⁻²) and 5% are extremely obese (BMI of ≥ 40 kg·m⁻²) (7). Because of this, Americans are seeking exercises that will assist in weight loss and improve cardiovascular fitness. There are many forms of aerobic exercise that are done in attempt to meet these recommendations and obtain the associated benefits. ACSM identifies these activities as being dynamic, rhythmic physical activities that use large muscle groups (7).

Performing the same activities repeatedly may become boring, resulting in a loss of interest and adherence in exercise. Consequently, alternative exercises have become an attractive alternative in comparison to traditional forms of exercise. Jackie Sorenson created an alternative form to traditional exercise, “aerobic dance,” in 1969, which will be the focus of this study. Aerobic dance involves a series of choreographed dance steps and whole body movements such as walking, running, and skipping choreographed into a routine and put to music, and has an intrinsic intensity high enough to create an aerobic training effect (6).

**History of Zumba®**

Over 7.5 million exercisers each week across the globe are ditching the workout and joining the party in fitness classes with the hottest fitness trend, Zumba®. This Latin fusion inspired workout claims to burn up to 1,000 calories per hour, while targeting the lower body, abs, core, and upper body (15).

Recently, celebrity fitness trainer, Alberto “Beto” Perez, developed a new form of aerobic dance, Zumba®. This new exercise form was born in Cali, Columbia in the mid
90s (3). Beto began choreographing for his local artists and dancing in salsa clubs. He later became an instructor at the prestigious Maria Sanford Brazilian Dance Academy where he taught Salsa, Merengue, Rumba, Tap, Funk, Jazz, and Modern Dance. Beto later became a certified personal trainer and group exercise instructor.

Zumba® fitness was first introduced in one of Beto’s classes when he forgot to bring his traditional aerobics music. The only music he had were Latin music tapes in his car. He let the music motivate him, just as if he were in a club and began dancing to salsa, rumba, and merengue. This was the start of the so called Latin fusion, Rumbacize (11). It became the most popular class offered at his gym.

In 1999 Beto brought Rumbacize to Miami, when he auditioned at Williams Island Spa. Two years later, two entrepreneurs, Alberto Aghion and Alberto Perlman, approached Beto. They convinced Beto to turn Rumbacize into a global company. Rumbacize changed its name to Zumba®, which in Spanish means, “buzz like a bee and move fast.”

Zumba® Timeline

In 2002, Aghion and Perlman made a deal with an infomercial company and launched Zumba® workout videos. Hundreds of thousands of videos were sold in the U.S. market. This created a demand for more Zumba® instructors; consequently, Zumba Fitness® created an instructor-training program to meet the rapid demand of instructors. In 2003, Zumba Fitness® developed a fitness campaign for the Hispanic market with the Kellogg Company. In 2004, Zumba Fitness® launched a Spanish workout DVD for the U.S. Hispanic market and Latin America in over 30 countries (W). In 2005, Zumba
Fitness® took another step up and developed the Zumba Academy®, which is aligned with fitness organizations such as AFAA, ACE, IDEA, SCW Fitness Education, and Can-Fit-Pro to train instructors. In 2007, the Zumba® program became international, spanning six continents. In 2008, Zumba® launched its third DVD collection, including Zumba Toning Sticks® and Zumba LIVE!® (14).

Currently, Beto’s Rumbacize fitness philosophy is led by over 13,000 certified instructors and practiced in 105 countries in 60,000 locations worldwide (14). Zumba® fitness sessions exhibit a party-like atmosphere with “no thinking” elements, while using the motivational ingredient, the music. Zumba® fitness classes were designed for all types of people with various levels of fitness and coordination. Beto choreographs over 50 new songs each year in order to help people look and feel great while dancing their cares away (11).

**ACSM Guidelines for Exercise Prescription and Other Free Range Exercises**

In order to determine if Zumba® elicits a training effect, it will be compared to the ACSM’s guidelines for exercise prescription as well as alternative forms of exercise. The alternative forms of exercise included in this discussion are Boot Camp, Hooping, Kettlebells, Krankcycle, Nia Technique, and Cycling.

**Boot Camp**

Porcari et al. (11) examined the exercise intensity and fitness benefits of popular boot camp-style workouts. Six men and women (19-29 years old) were recruited for this study. All subjects were given a treadmill max test to determine maximal heart rate and
maximal oxygen uptake prior to the testing. Rate of perceived exertion (RPE) on a 6-20 Borge scale was recorded throughout the testing. Once the baseline was established, the subjects came back to the lab to watch a 40-minute video recording of a boot camp workout. The subjects were given the video to take home to familiarize themselves with the workout. Once they felt comfortable with the choreography, the subjects returned to the lab for testing. Each subject was fitted with a Cosmed portable analyzer which measures oxygen consumption and energy expenditure. Heart rate and RPE were taken every three minutes throughout the 40-minute workout video. The subjects’ average exercise intensity was 77% of HRmax and the average energy expenditure was 400 kcal/40-minute session. Based on this study, boot camp was found to be within ACSM’s recommendations for exercise intensity (11).

**Hooping**

Holthusen et al. (9) examined the caloric expenditure and relative exercise intensity of hooping as a free range exercise. Subjects included 16 apparently healthy females (16-59 years old). Each subject followed a 35-minute hooping video, including a 5-minute warm-up and 30 minutes of hooping, developed by the founder of “Hooked on Hooping.” The 30-minute hooping section of the video included seven different dances/songs with diverse choreography. Prior to the testing, the subjects were given access to the video to practice two sessions before the test. The subjects were fitted with a portable oxygen analyzer and Polar telemetric unit while they hooped to the video at their own intensity. Throughout the test, heart rate and oxygen consumption (VO₂) were recorded every minute. Caloric expenditure was determined from the VO₂ data. RPE was
measured every five minutes using the 6-20 Borge scale. The subjects’ average caloric expenditure was 210 kcal/30 minute session and average exercise intensity was 84% of HRmax. Based on the findings of this study, hooping was found to be within ACSM’s guidelines for exercise intensity.

**Kettlebells**

Schnettler et al. (13) examined the energy expenditure and exercise intensity of kettlebell workouts. The subjects consisted of 10 male and female volunteers (29-46 years old). Prior to the study, each subject was given a treadmill maximal exercise test, where oxygen consumption and heart rate were measured constantly. RPE was also measured. Once the baseline was established, each subject returned to the lab on a separate day to perform a five-minute kettlebell VO2max snatch test to establish a baseline for specific kettlebell fitness. The test format went as follows: minute one: 8 repetitions at a rate of 1 snatch every 7 seconds, minute 2: 12 repetitions at a rate of 1 snatch every 7 seconds, minute 3: 15 repetitions at a rate of 1 snatch every 4 seconds, minute 4: 20 repetitions at a rate of 1 snatch every 3 seconds. Heart rate and VO2 were measured during each minute. A peak exercise RPE was measured following the testing as well as a blood lactate concentration three minutes after the completion of the test. The number of snatches completed during the final minute of the max test divided by four determined how many snatches the subject would need to complete during each 15 seconds of the 20 minute snatch workout. After both the treadmill and snatch max tests were completed, the subjects performed a 20-minute snatch workout, which consisted of 15 second of work followed by 15 seconds of rest. Throughout the workout, heart rate
was measured every minute as well as blood lactate following the completion of the workout. The subjects' average energy expenditure was 272 kcal/20 minutes session and average exercise intensity of 77% of HRmax. Based on the findings in this study, kettlebells were found to be within the recommended guidelines for exercise intensity.

**Krancycle**

Boyer et al. (3) examined the average calorie burn and exercise intensity of a typical Krancycle group workout. The subjects included of 12 volunteers, male and female (20-30 years old), who has never used a Krancycle previously. Prior to the testing, each subject performed three habituation trials on the krancycle, where they build upper-body endurance and became familiar with the Krancycle. Each subject then performed a maximal test on the Krancycle. During this max test, heart rate, VO₂, heart rate, and RPE were constantly monitored. After the baseline fitness was determined, all of the subjects participated in a group Krancycle class led by the Krancycling's head of training and education. During the test, each subject wore a Suunto heart-rate monitor and had his/her own Krancycle. The instructor was able to monitor the subjects' heart-rate by a projection screen in the room. The instructor informed the subjects to keep his or her exercise intensity within the specific, choreographed heart-rate zones. The researchers measured rate of perceived exertion every 5 minutes throughout the class. The subjects' average calorie burn was 269 kcal/30-minute and average exercise intensity of 86% HRmax during the Krancycling workout. Based on the findings of this study, Krancycle was found to be within the ACSM's recommended guidelines of exercise intensity.
Nia Technique

Kouemann et al. (1) examined the acute physiological responses to the Nia Technique to determine exercise intensity and energy expenditure. The subjects included 13 apparently healthy females who had no prior training in the Nia Technique. Each subject completed a VO2 max walking test on a treadmill within the first two weeks of the study. During the test, VO2, heart rate, energy expenditure, and RPE were measured constantly. Subjects’ individual training zone was determined to classify exercise intensity. Subjects returned to the lab four weeks later to perform a 55-minute video-recorded Nia class, while being fitted to a portable metabolic analyzer to measure oxygen consumption, heart rate, and RPE. Energy expenditure was then determined on the non-protein RER table. Acute psychological responses to a single Nia session were also recorded. State and trait anxiety levels were measured before and after the 55-minute Nia class using the State-Trait Anxiety Inventory and Likert scale. The subjects’ average energy expenditure 165 kcal/55-minute session and average exercise intensity of 60.9% HRmax. Based on the findings in the study, the Nia Technique was not found to be within ACSM’s recommended guidelines of exercise intensity (1).

Indoor Cycling

Battista et al. (2) examined the exercise intensity and associated risks during indoor cycling. The subjects included 20 healthy, physically active females who had experience with indoor cycling. Each subject performed three exercise tests. The first test was completed on an electronically braked cycle ergometer to determine VO2 max. During the other two tests, the subjects exercised to a video recorded indoor cycling class.
lasting 45 minutes. VO₂, heart rate, and RPE were measured during the indoor cycling classes with VO₂ data integrated at 30-second intervals. The subjects’ average energy intensity was 74% and 66% of HRmax for class 1 and 2 respectively. Frequent observations of transient values of VO₂ exceeding VO₂max were observed. Based on the findings in this study, indoor cycling was found to be within ACSM’s recommended guidelines for exercise intensity.
CONCLUSION

The ACSM guidelines for exercise intensity were published to promote a healthy and active lifestyle as well as reduce the risk for chronic diseases in Americans. When choosing an exercise or physical activity to participate in, exercise intensity should be considered. Zumba® fitness session are the hottest new trend in fitness facilities across the globe, so it reasonable to research the relative exercise intensity as well as energy expenditure in comparison to the ACSM recommendations.
REFERENCES


