

**DAFT STEADY INCREASE TRAINING VERSUS PLYOMETRIC HIGH  
INTENSITY INTERVAL TRAINING ON CARDIOVASCULAR LEVELS IN  
COLLEGIATE DANCERS**

An Undergraduate Research Scholars Thesis

by

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# TABLE OF CONTENTS

	Page
ABSTRACT.....	1
Literature Review.....	1
Thesis Statement.....	4
Theoretical Framework.....	4
Project Description.....	4
ACKNOWLEDGMENTS .....	6
KEY WORDS.....	7
INTRODUCTION .....	8
CHAPTERS	
I.    METHODS .....	10
Methods Overview.....	10
Method Layout.....	11
II.   DATA/ANALYSIS.....	12
Results.....	12
Analysis.....	13
CONCLUSION.....	14
WORKS CITED .....	15

## **ABSTRACT**

### **DAFT Steady Increase Training versus Plyometric High Intensity Interval Training on Cardiovascular Levels in Collegiate Dancers**

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#### **Literature Review**

A literature review was done spanning different aerobic training practices throughout sport studies, with an emphasis in dance. It is known that dance technique classes alone are not a sufficient way to train dancers cardiovascular fitness. Cross training has been proven to be very beneficial for dancers' cardiovascular stamina and endurance. The research selected for this review has an overarching topic related to cardiovascular fitness or aerobic training. Research was also found to support the use of the Dance Specific Aerobic Fitness Test in measuring the aerobic fitness levels of dance populations.

The use of activity-specific exercise has been researched in a variety of areas outside of the dance community. Hoff (2002) used soccer specific aerobic exercises to see if it was an efficient way to perform interval training in his study *Soccer Specific Aerobic Endurance Training*. The study evaluated the maximal oxygen uptake, aerobic threshold, and work economy. There was a comparison between the soccer specific exercise group and a laboratory group, which used a treadmill as a training method. Findings of the study indicated that the

soccer specific activities were an efficient interval-training program for the players. The study also proved that heart rate monitoring is a valid method of exercise intensity.

Irving et al. (2009) goes into detail within topic of a dancer's fitness level with their study *Dance Science: Investigations into the effect of dance specific fitness training and its impact upon pedagogic practices and dance performance*. Included is information about aerobic training and how important it is for a dancer to have cardiovascular endurance. The Dance Aerobic Fitness Test is mentioned as a way to increase aerobic capacity, which is important for a dancer's overall health and success in the dance world. Redding (2009) reviews the research study that was done to validate the Dance Aerobic Fitness Test (DAFT) in her study, *The development of a high intensity dance performance fitness test*. Prior to the DAFT, no dance specific aerobic test existed. The DAFT test was created to mimic the environment of a performance, which is more aerobic compared to a technique class. Wyon et al. (2003) explain what the DAFT is, and how it was created in their review, *Development, Reliability, and Validity of a Multistage Dance Specific Aerobic Fitness Test*. The authors go into detail regarding how the test was arranged into five different levels based on the heart rate, oxygen consumption, and challenge the research subjects faced. The description and analysis of the trial at the beginning stages of the DAFT will be helpful for forming hypothesis and comparing results on the research about to be conducted.

Redding et al. (2003) outlines different methods used to measure aerobic power of dance in the study *Strengths and Weaknesses of Current Methods for Evaluating the Aerobic Power of Dancers*. It discusses that most dance research that has been used to measure work output of dance does not focus on the fact that dance is not a steady state activity. Krause et al. (2015) discusses the difference in physical demands between training in dance classes and performance with the study *Cardiorespiratory Considerations in Dance: From Classes to Performances*. It

also discusses how dancers need supplemental training so that they are able to meet the physical demands of performance. The authors not only argue that this supplemental training will increase dancers' artistic expression, but it will also reduce risk of injury. This source outlines the cardiorespiratory demands of various dance styles and how these demands increase during performance time. Wyon et al. (2005) discusses the different demands that rehearsal and performances have for a dancer in their study *Physiological Monitoring of Cardiorespiratory Adaptations During Rehearsal and Performance of Contemporary Dance*. The study within this source reveals the need for cross training within dance. It shows that most classes have an emphasis on technique and that an aerobic type of training also needs to be included within class. This source will help solidify the importance of aerobic training as well as aid in the overall understanding of why aerobic training is useful for dancers.

The goal of *DAFT Steady Increase Training versus Plyometric High Intensity Interval Training on Cardiovascular Levels in Collegiate Dancers* is to compare the use of different cardiovascular training methods, aerobic versus anaerobic, effect on dancer cardiovascular fitness. Using an activity-specific exercise plan has been proven to be beneficial for the participants in the specific activity. This is important for the purpose of our study in justifying the use of the DAFT as a training program for dancers. Viewing the importance of supplemental training Krause et al. research will help ensure that training programs for dancers' physical demands are comparable to those experienced during performance. The validation of the DAFT ensures that using this method to see an improvement in dancers' maximal heart rate over time shows an improvement in aerobic fitness. Redding's research helps to clarify and validate what approach should be made when deciding what type of aerobic training is best for dancers, while also giving insight in how to measure a dancer's aerobic capacity.

## **Thesis Statement**

The purpose of this study was to analyze the effects of using the Dance Aerobic Fitness Test (DAFT) in collegiate dancers' training in order to improve their overall cardiovascular stamina and endurance.

## **Theoretical Framework**

The 11 participants in this study were split into three different groups, a control group consisting of 3 participants, a DAFT training group with 5 participants, and a Plyometric High Intensity Interval Training (HIIT) group with 2 participants. Each group took part in the pre and post test and the DAFT and Plyometric HIIT groups trained three days a week for three weeks.

## **Project Description**

While dancers attend daily technique classes and rehearsals, they often struggle with cardiovascular stamina and endurance due to the anaerobic nature of dance training. This proves to be consequential during a dancer's performance season because they often are unable to maintain a healthy heart rate during fast-paced dance works. Additionally, they struggle to recover after many fast-paced movements, thus making it more difficult for them to complete an entire performance. Cross training has been proven to be very beneficial for dancers' cardiovascular stamina and endurance. This study consisted of a control group that did not train in DAFT or Plyometric HIIT but still participated in Modern and Ballet dance technique classes three times a week, with each class lasting an hour and twenty minutes. The DAFT group participated in training as well as Modern and Ballet dance technique classes three times a week. The Plyometric HIIT group participated in training along with Modern and Ballet dance technique classes three times a week. The participants were evaluated on their maintenance of

proper technique throughout the testing procedures and the maximum heart rate was collected manually via finding the participant's pulse for ten seconds. The maintenance of the technique at high levels of activity was an indicator of cardiovascular fitness. The heart rate was taken after each stage and after a two-minute recovery period. These values were compared to analyze dancers' cardiovascular fitness.

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## **KEY WORDS**

DAFT      Dance Aerobic Fitness Test

HIIT      High Intensity Interval Training

## INTRODUCTION

Cardiovascular endurance in dancers is often one of the weakest physiological aspects of a dancer's health. Dance class alone is not enough to support the demands of a dance performance (Krause). The dance technique class layout has dancers exercising in an anaerobic format. A typical dance technique class is structured with the instructor teaching an exercise, the dancers performing the exercise, and a period of rest while the next exercise is being taught. This causes dance classes to be very intermittent in nature. The problem with this methodology of training is during performances dancers are expected to perform explosive movements for a constant amount of time with no rest (Krause). An emphasis on aerobic training is necessary to include in class to meet the physical and cardiovascular demands of rehearsals and performances (Wyon). Aerobic training is associated with moderate, long-term levels of activity within the aerobic threshold. Anaerobic training is associated with high intensity, maximal, short bursts of activity (Irvine et al).

Research on how to improve a dancer's cardiovascular health is very limited. The goal of this research study was to create a new way for dancers to cross train outside of dance class. The two different methods used looked into anaerobic and aerobic supplemental training. Not only can this supplemental training be beneficial to cardiovascular health, it can also increase a dancer's artistry as well as lessen the risk for injury (Krause). The importance of this research is to look at the effects of anaerobic versus aerobic training and how it increases the cardiovascular health of dancers, so that it can then be applied to dance classes in the future.

Two different training methods were used in this study: the DAFT created by Emma Redding and Matthew Wyon at the Trinity Laban Conservatoire of Music and Dance, and the

Plyometric HIIT training developed from exercises used by the Harkness Center for Dance Injuries in New York. The DAFT has been validated through research to be a sufficient way to test dancer's aerobic fitness. The Plyometric HIIT training was created for this study to mimic the design of the DAFT. Each stage of the Plyometric HIIT training lasted for four minutes with one minute break in between. The difference between the DAFT and the Plyometric HIIT trainings is the DAFT has a constant increase in tempo where as the Plyometric HIIT is developed in a high intensity interval training style, alternating from high intensity to low intensity.

# CHAPTER I

## METHODS

### Methods Overview

Participants were randomly placed in a control group, a DAFT group, or a Plyometric HIIT group. There were ten total participants involved; three participants in the control group, five in the DAFT group, and two in the Plyometric HIIT group. This study spanned five weeks, with each group participating in the pre and post tests during Week 1 and Week 5. The DAFT group and Plyometric HIIT group trained during weeks 2-4 for 30-minutes, three times per week (Monday, Wednesday, Friday), with a day of recovery in between each training session and two-day recovery between each week.

During the pre and post test weeks, all research subjects completed a 30-minute test session of the DAFT on Day 1, and a 30-minute test session of the Plyometric HIIT on Day 2. Prior to the testing, the research subjects had 10 minutes of rest in a comfortable sitting or lying position in order to obtain an a more consistent resting heart rate. After the 10 minutes, the DAFT or Plyometric HIIT test took place with five, four-minute stages. After each stage, the subjects heart rate was measured and recorded. A recovery period took place after the 5<sup>th</sup> and final stage that lasted 2 minutes; heart rate was recorded after this time. The DAFT movements can be seen in Table 1, and the Plyometric HIIT layout can be seen in Table 2. Throughout the training weeks, each training group performed their specific training method. The same protocols took place as the pre and post testing days with regards to the resting interval, the five exercise stages including the heart rate taken after each stage, and the recovery time.

## Method Layout

**Table 1: Dance Aerobic Fitness Test:**

STAGE	TEMPO (b*min <sup>-1</sup> )	MOVEMENT
1	68	5 steps, lunge and recover. 4 sets of 2 pliés with 90° turn between each set. Repeat for 4 minutes.
2	78	5 steps, lunge and recover. 3 spring hops in a circle. 4 sets of 2 pliés with 90° turn between each set, arms moving between first and second position. Repeat for 4 minutes.
3	78	5 steps, lunge and recover. 3 spring hops in a circle include arm movements. 4 sets of hop plié with 90° turn between each set, arms moving between first and second position. Repeat for 4 minutes.
4	94	5 steps, lunge and recover. 3 spring hops in a circle include arm movements. 4 sets of hop, hop with 90° turn between each set, arms moving between first and second position. Repeat for 4 minutes.
5	108	5 springs, lunge and recover. 3 spring hops in a circle include arm movements. 4 sets of hop, hop with 90° turn between each set, arms moving between first and second position. Repeat for 4 minutes.

**Table 2: Plyometric HIIT:**

Stage	TEMPO (b*min <sup>-1</sup> )	MOVEMENT
1	94	Prance right and left 30 seconds and pony right and left 30 seconds. Repeat for 4 minutes
2	68	Step forward to lunge 30 seconds and Jump switching lunges 30 seconds. Repeat for 4 minutes
3	94	Parallel pas de chat side/side 30 seconds and externally rotated changement 30 seconds. Repeat for 4 minutes
4	68	Step forward to lunge 30 and jump switching lunges 30 seconds. Repeat for 4 minutes
5	108	Changement turn 90 degrees 30 seconds and externally rotated jetés and coupe sauté alternating right and left 30 seconds. Repeat for 4 minutes

## CHAPTER II

### ANALYSIS OF RESULTS

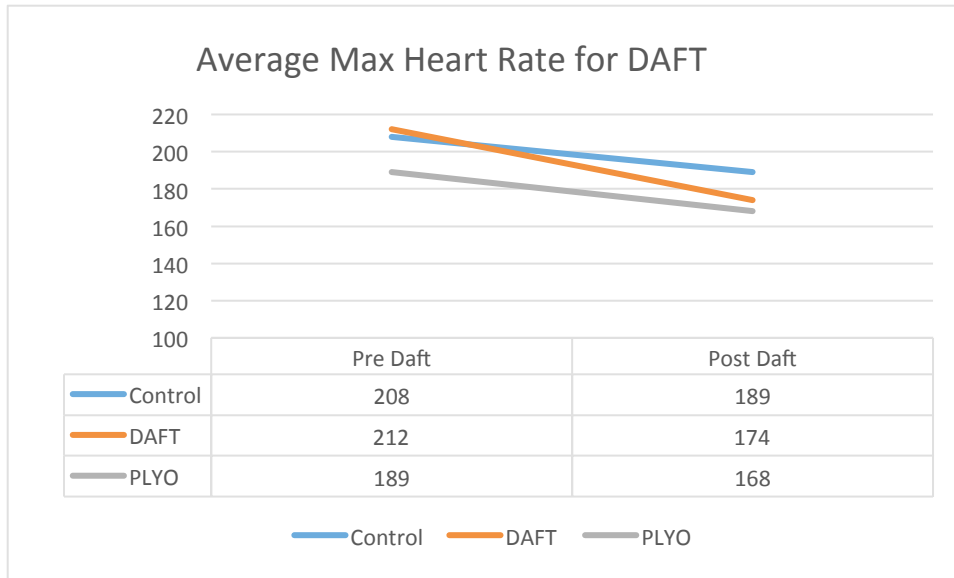
#### **Results**

After the 5-week study, a change in max heart rate was recognized for both training methods. A greater change in max heart rate was recognized using the DAFT compared to the Plyometric HIIT work out. The average calculated for the Plyometric HIIT group showed a decrease that was not as significant when compared to the DAFT and control groups because of the small number of participants.

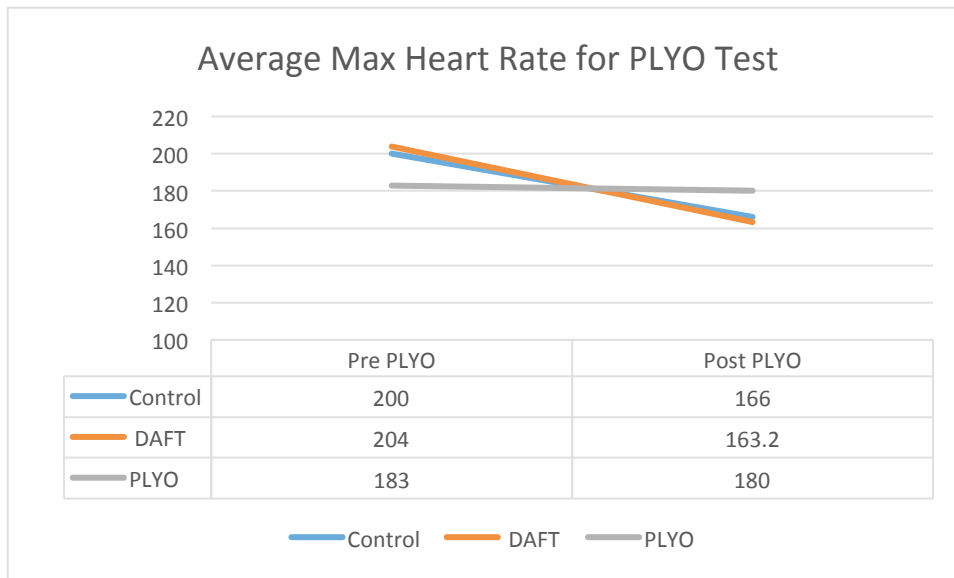
The DAFT training group had an average decrease of 38 beats per minute (bpm) during the DAFT and an average decrease of 40.8 bpm during the Plyometric HIIT test. The Plyometric training group had an average decrease of 21 bpm and 3 bpm for the DAFT and Plyometric HIIT tests, respectively. The control group had an average decrease of 19 bpm for the DAFT and 34 bpm for the Plyometric HIIT test. Results for the DAFT pre and post tests can be seen in Graph 1, and the results for the Plyometric HIIT pre and post test can be seen in Graph 2 on the next page. The values for the three different testing groups (DAFT, Plyometric HIIT and control) are displayed on each graph.

## Analysis

Graph 1: DAFT Pre and Post test Max Heart Rate



Graph 2: Plyometric HIIT Pre and Post Test Max Heart Rate



## CONCLUSION

Based on these results, an improvement in cardiovascular fitness can be seen. However, because of the few number of participants there is no statistically significant data to accurately describe the improvement. A decrease in max heart rate shows an increase in cardiovascular fitness but an increase in cardiovascular endurance cannot be reached solely off of the max heart rate values. The results from this experiment show that the DAFT serves as a better training program for an improvement in cardiovascular fitness. The aerobic training had a greater improvement on max heart rate when compared to the anaerobic training of the Plyometric HIIT. Based on the hypothesis, the DAFT does prove to be beneficial as a training program for aerobic exercise.

Moving forward with this research, it is suggested to analyze the recovery time in more depth to see a true change in cardiovascular endurance within the participants. Due to manual measuring of heart rate, there could be some errors in numbers. In the future, a heart rate monitor should be worn in order to collect more accurate heart rate data throughout the exercises. This study serves as a pilot study to see how aerobic and anaerobic training can improve a dancer's cardiovascular endurance.



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