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# The Effects of Participation in Marching Band on Physical Activity and Physical Fitness in College Aged Men and Women

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# Welcome!





# **The Effects of Participation in Marching Band on Physical Activity and Physical Fitness in College Aged Men and Women**

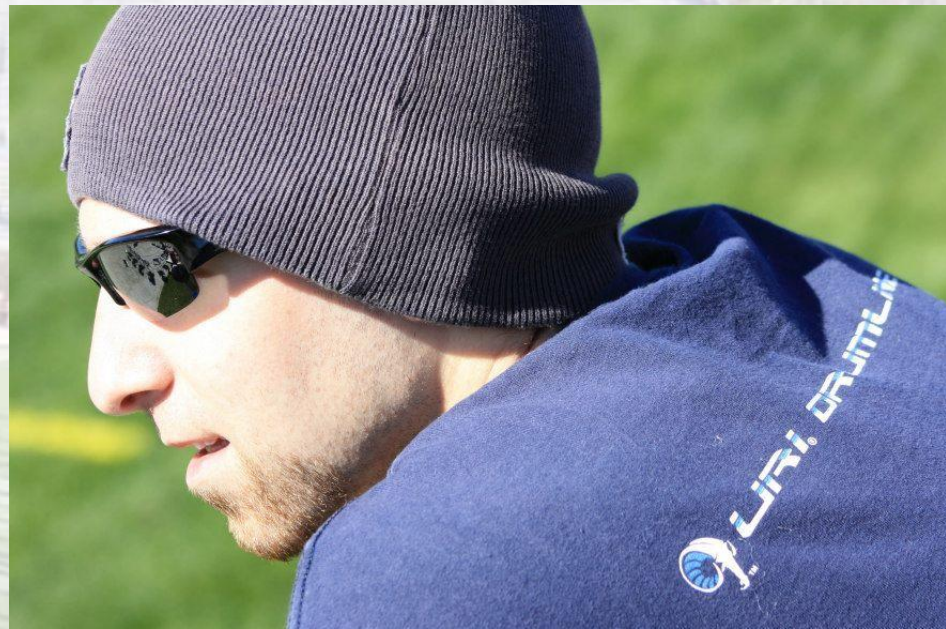
Principal Investigators: Joseph Vallee  
and Kristen Leander

Faculty Advisor: Dr. Deborah Riebe

An aerial view of a football stadium. The bleachers are blue and white, and the field is green with white yard lines. A marching band in blue and white uniforms is performing on the field. The word "ROB" is visible on the top of the bleachers.

# Outline

- Introduction
- Background Information
- Purpose and Hypotheses
- Methods
- Results
- Discussion
- Limitations
- Future Research



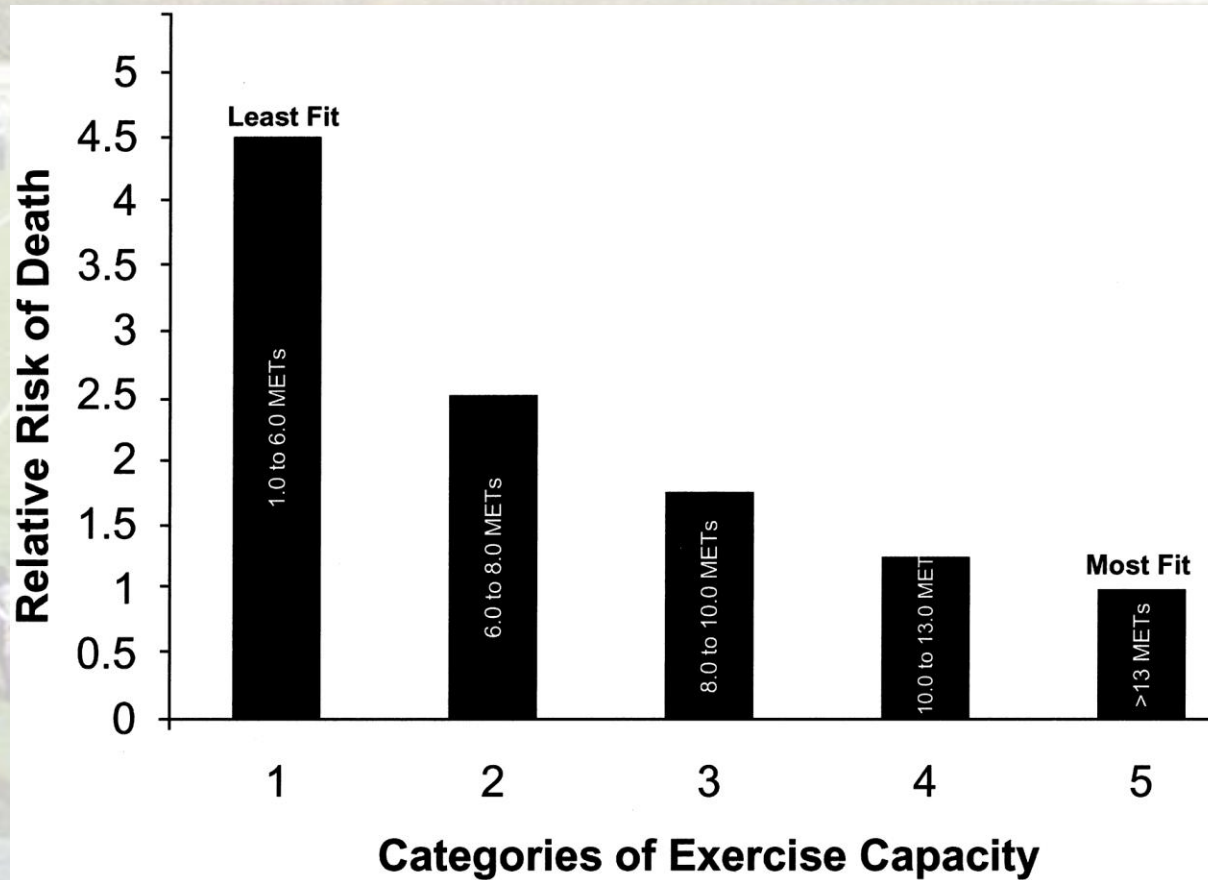
Kristen and Joe

# Exercise and Health

There is overwhelming evidence that exercise provides health benefits and decrease the risk of:

- Premature mortality
- Coronary artery disease
- Ischemic/hemorrhagic stroke
- Hypertension
- Type 2 diabetes mellitus
- Breast and colon cancer
- Falls
- Preserves bone mass
- Depression
- Osteoarthritis
- Anxiety
- Peripheral Artery Disease
- Hypercholesterolemia
- Weight Loss
- C-reactive protein and other CHD biomarkers
- Enhances feelings of "energy", well-being, quality of life, and cognitive function and is associated with a lower risk of cognitive decline and dementia

# Exercise and All-Cause Mortality



# Exercise Guidelines

- Physical Activity guidelines (ACSM 2013):
  - 150 minutes of moderate-intensity physical activity per week; OR
  - 75 minutes of vigorous-intensity physical activity per week (75 minutes per week), OR
  - Combination of moderate and vigorous exercise week.
- Most people do not meet these guidelines
  - More than 80% of adults do not meet the physical activity guidelines
  - 32.6% of adults do not participate in any leisure time physical activity  
(United States Department of Health and Human Services, Healthy People 2020. (2011, June 29).
  - The WHO states that physical inactivity (lack of physical activity) has been identified as the fourth leading risk factor for global mortality (6% of deaths globally)



# Why Don't People Exercise?

- Lack of time
- Negative thoughts about exercise
- Unaware of the benefits
- Lack of motivation
- Fear of injury
- Fear of falling (older adults)
- Don't know how
- Too tired to exercise
- **Lack of enjoyment**

Kendzierski, D., & Johnson, W. (1993). *Journal Of Sport & Exercise Psychology*.

Kwan, B. M., & Bryan, A. D. (2010). Affective response to exercise as a component of exercise motivation: Attitudes, norms, self-efficacy, and temporal stability of intentions.

# Why Marching Band?

- Video clip:

[http://www.youtube.com/watch?v=hk\\_SRUJFN8](http://www.youtube.com/watch?v=hk_SRUJFN8)



- Research shows evidence that people do not exercise when they do not enjoy the activity

# Marching Band and Exercise

- Cowen, V (2006) found:
  - Band members took an average of  $13,987.8 \pm 4,715.7$  steps on game day
  - $8,337.5 \pm 4,015.7$  steps on non game days
- Edwards, J (2008) found that a drumline member works as hard as a professional football player.
  - HR over 200bpm
  - $VO_2$  over 40 mL/kg/min



# Marching Band and Exercise

- Erdmann, L. D. et al. (2003) looked at the energy cost of marching band
  - Energy demand ranged from 4.0 to 6.5 METS
    - Moderate activity
- Wenta, M. R. (2011) investigated energy balance of marching band members
  - Negative energy balance of  $-661 \text{ kcals} \pm 785 \text{ kcals}$  per day

# Purpose

- **Primary Goal:**
  - To see whether the band improves their cardiorespiratory fitness from pre-season to post season
  - To evaluate the amount of physical activity associated with a non-traditional activity, marching band, and if it assists in reaching ACSM guidelines and thus attribute to healthy lifestyles.
- **Secondary Goal:** To assess whether the drumline or woodwinds/brass benefited more

# Hypotheses

1. Marching band members will have a significantly higher  $VO_{2max}$  at the end of the season compared to the pre-season.
2. Marching band members will have a lower percentage of body fat at the end of the season compared to the pre-season.
3. Band members will meet ACSM guidelines for moderate-intensity physical activity based on percentage of time spent in their target heart rate zone and the number of steps taken during regular practice sessions.
4. The drumline will have a significantly greater improvement in  $VO_{2max}$  compared to the brass and woodwinds sections.
5. The drumline members will spend more percentage of time in their target heart rate zone compared to the brass and woodwinds.

# Institutional Review Board

- A full proposal was submitted to the URI Institutional Review Board (IRB) for approval
  - Research
  - Develop methods
  - Write Informed Consent
  - Find a Medical Questionnaire
  - Write proposal

# Procedure/ Design

- Two parts:
  - Pre/Post season
    - Anthropometrics
    - Body Composition
      - % body fat
    - Cardiorespiratory Fitness
      - Maximal exercise test to determine  $VO_2\text{max}$
  - Practices
    - During the marching band season, the quantity and intensity of physical activity accomplished during a routine band practice was measured on five occasions.



# Measures

- Anthropometrics
  - Height
  - Weight
  - BMI



# Measures

- Body Composition
  - Air Displacement Plethysmography (Bod Pod)

```
: Joe      Height : 67   ins  1  
: Vallee   Weight : 144.2 lbs 65  
st: Jul 25 2012 Age   : 21   yrs  
: kristen  Gender : M     (M/F)
```

```
— PRESS <ENTER> TO SAVE —  
Percent Fat: 14.6 %  
Body Weight: 144.2 lbs  
Fat Weight: 21.1 lbs  
Lean Weight: 123.1 lbs  
Lung Volume: 3.5 L-P
```



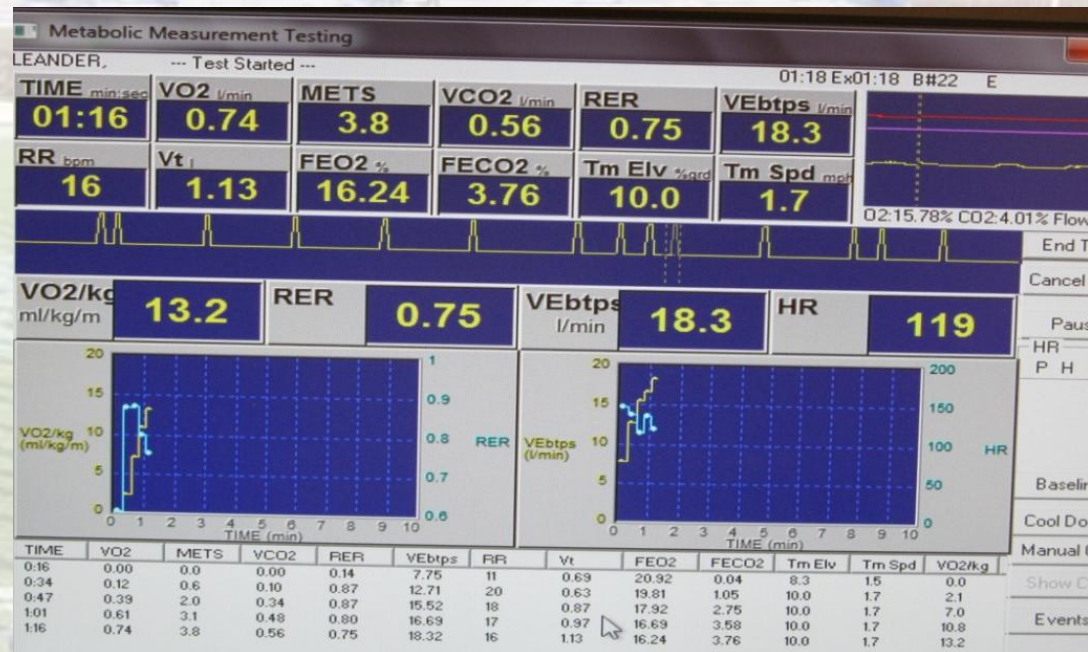
# Measures

- Maximal Exercise Testing
  - Determines  $\text{VO}_2\text{max}$
  - Requires a metabolic cart, treadmill, heart rate monitor, and Rating of Perceived Exertion Scale (RPE)
- How do you know if subject gives a maximal effort?
  - $\text{RPE} \geq 17$
  - $\text{HRmax}$  within 10% of age predicted  $\text{HRmax}$
  - $\text{RER} \geq 1.1$



## BORG'S RPE SCALE

6	Very, very light
7	
8	
9	Very light
10	
11	Fairly light
12	
13	<b>SOMEWHAT HARD</b>
14	
15	Hard
16	
17	Very hard
18	
19	Very, very hard
20	



# Measures

- Physical activity during practice was measured using
  - Suunto Heart Rate Monitor – provided the number of minutes in MVPA
  - Pedometer – number of steps



# Statistical Analysis

- Means and standard deviations were calculated for all variables.
- Changes in cardiorespiratory fitness and body composition for all band members were examined using a paired t-test.
- Change scores for cardiorespiratory fitness and body composition between band sections were examined using a t-test.
- The amount of time spent in MVPA and the number of steps taken during practice was compared to national recommendations.
- Significance levels were set at  $p < 0.05$  level for all analyses.
- All analyses were done using SPSS software

# Descriptive Characteristics (n = 21)

Age (years)	20.2 ± 2.97
Height (cm)	172.7 ± 7.56
Weight (kg)	80.1 ± 27.9
BMI (kg/m <sup>2</sup> )	26.56 ± 8.1
Sex	66.7% Male 33.3% Female
Section	57.1 % Drumline 42.9% Woodwind/Brass

# Body Composition

	Pre	Post
Weight (kg)	80.1 ± 27.9	80.4 ± 28.5
BMI (kg/m <sup>2</sup> )	26.56 ± 8.1	26.6 ± 8.1
% Body Fat	24.8 ± 12.1	25.8 ± 10.1
Fat Weight (kg)	22.1 ± 17.4	22.6 ± 15.8
Lean Weight (kg)	58.0 ± 14.6	57.8 ± 15.0



# Maximal Exercise Test

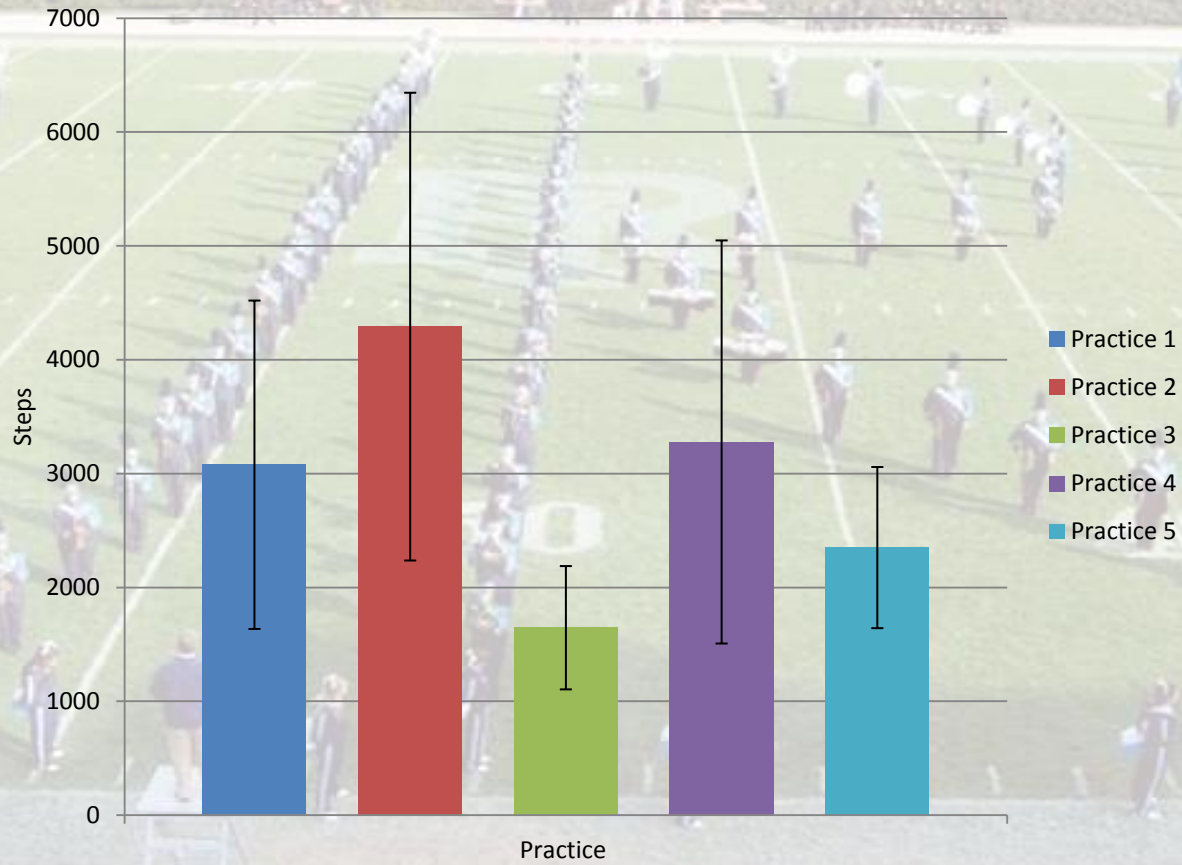
	Pre	Post
RERmax	1.22 ± .09	1.17 ± .07
HRmax (bpm)	195.6 ± 8.76	194.9 ± 7.9
RPEmax	17.2 ± 1.5	17.3 ± 1.7
Treadmill Time (seconds)	579.3 ± 112.1	608.2 ± 99.0*
VO2max (mL/kg/min)	38.5 ± 9.23	40.8 ± 8.5*

# Practice

Steps	$2930.1 \pm 1075.8$
Time in moderate (minutes)	$12.4 \pm 6.4$
Time in vigorous (minutes)	$6.37 \pm 6.8$
Time in moderate + vigorous (minutes)	$18.75 \pm 12.4$
Time in moderate + vigorous + light (minutes)	$29.7 \pm 14.9$

# Practice

## Steps Per Practice



# Section Comparison-Descriptive

	<b>Woodwind/Brass (n = 12)</b>	<b>Drumline (n = 9)</b>
Age (years)	20.1 ± 1.2	20.4 ± 1.1
BMI (kg/m <sup>2</sup> )	26.4 ± 8.3	26.8 ± 8.3
Sex	66.7% Male 33.3% Female	66.7% Male 33.3% Female
Height (cm)	173.0 ± 6.4	172.1 ± 9.3
Weight (kg)	79.8 ± 27.7	80.6 ± 29.8

# Section Comparison- Body Composition

	Woodwind/Brass		Drumline	
	Pre	Post	Pre	Post
Weight (kg)	79.8 ± 27.7	79.1 ± 28.8	80.6 ± 29.8	82.1 ± 29.7
BMI (kg/m <sup>2</sup> )	26.4 ± 8.3	26.1 ± 8.42	26.8 ± 8.3	27.3 ± 8.2
% Body Fat	25.6 ± 11.5	26.2 ± 12.3	23.7 ± 13.4	25.3 ± 7.0
Fat Weight (kg)	22.2 ± 15.6	23.0 ± 17.3	22.0 ± 20.5	22.2 ± 14.7
Lean Weight (kg)	57.6 ± 16.3	56.1 ± 14.8	58.6 ± 12.9	60.0 ± 16.0

# Section Comparison- Maximal Exercise Test

	Woodwind/Brass		Drumline	
	Pre	Post	Pre	Post
RERmax	1.19 ± .08	1.15 ± .08	1.25 ± .08	1.19 ± .06
Hrmax (bpm)	193.2 ± 8.4	192.6 ± 7.7	198.6 ± 8.8	197.9 ± 8.2
RPEmax	17.3 ± 1.3	17.3 ± 2	17.0 ± 1.8	17.4 ± 1.2
Treadmill Time (seconds)	567.7 ± 93.3	608.3 ± 88.7	595.3 ± 139.3	608.1 ± 198.6
Change in Time (sec)	33.2 ± 42.5		11.4 ± 39.7	
VO2max (mL/kg/min)	37.4 ± 6.7	41.0 ± 7.4	40.1 ± 12.2	40.5 ± 10.4
Change in VO2max	3.6 ± 2.4		.39 ± 2.6*	

# Section Comparison- Practice

	Woodwind/Brass	Drumline
Time in All zones	24.8 ± 12.9	36.3 ± 1
Time in Moderate	10.5 ± 5.4	14.9 ± 7.1
Time in Vigorous	4.7 ± 6.3	8.6 ± 7.0
Time in Moderate + Vigorous	15.2 ± 10.5	23.5 ± 13.8
Steps	2513.9 ± 1111.6	3485.1 ± 766.7*

# Marching Band

- Body Composition
  - No change
- Cardiorespiratory Fitness
  - Marching band improved CRF
- Practice
  - Did not meet ACSM guidelines for PA
  - PA contributed toward overall total steps and minutes of MVPA per day



# Section Comparison

- Practice
  - Drumline took more steps
  - More time in MVPA
- Body Composition
  - No change in either section
- Cardiorespiratory Fitness
  - Woodwinds/brass had greater improvements compared to drumline
    - Unexpected finding
    - May be due to higher baseline levels of CRF in drumline at baseline

# Limitations

- Small number of subjects
- Not all subjects completed the  $\text{VO}_2\text{max}$  test
- Not all subjects came to every practice

# Future Research

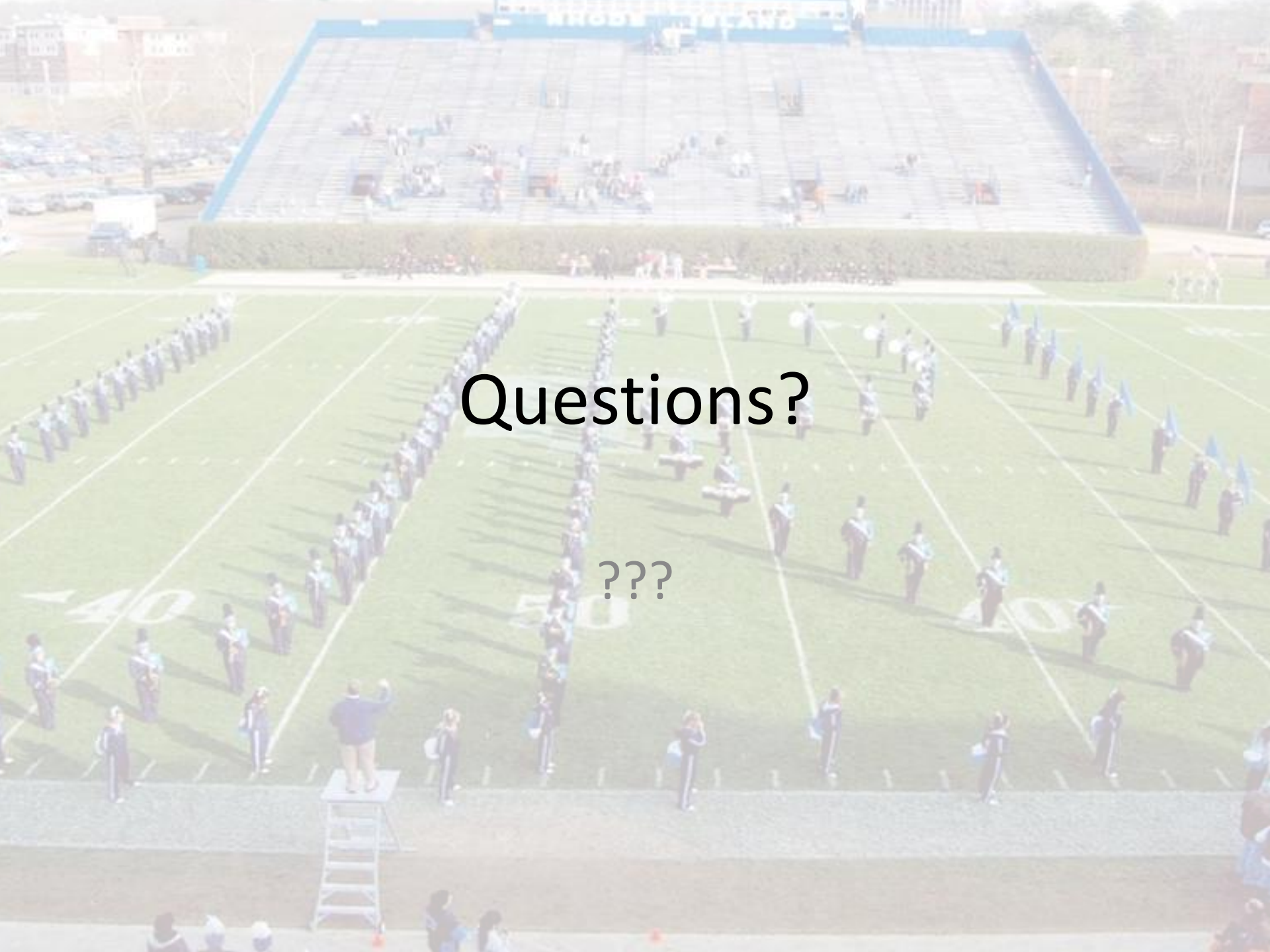
- How hard do marching band members work during a game?
- Follow band for entire season
- Other non-traditional means of exercise

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# Acknowledgements



Questions?

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Thank you!