Should Marching Band be Allowed to Replace Physical Education Credits: An Analysis

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Abstract

The general purpose of this study was to determine if marching band members, while carrying instruments, obtained 30 minutes of moderate intensity physical activity on a daily basis. Heart rates were collected on 16 members of a university marching band. Results indicate a significant difference in highest heart rate means for those carrying light and heavy instruments. Subjects carrying heavy instruments obtained moderate intensity physical activity for 9.5 minutes daily while subjects carrying light instruments obtained moderate intensity physical activity for 8.3 minutes daily. Subjects did not meet the Surgeon General's recommendation of 30 minutes daily of moderate activity from participation in marching band.

Introduction

Historically, individuals striving to develop fitness were encouraged to follow the exercise prescription guidelines set forth by the American College of Sports Medicine (ACSM) which recommended that individuals train 3-5 days per week for at least 20-60 continuous minutes, performing activities that require large muscle groups at 60-90 percent of maximum heart rate intensity (American College of Sports Medicine, 1995). More recently, we know that health/fitness benefits can be obtained with much lower heart rate intensities than previously believed (Blair, 1993).

The Centers for Disease Prevention and the ACSM now suggest that every adult obtain about 30 minutes of moderate-intensity physical activity on most, if not all, days of the week (Pate et al., 1995; U.S. Department of Health and Human Services, 1996). Moderate activity has been defined as activity in which the heart rate is greater than 40 percent of maximum but less than 60 percent maximum (Strand, Scantling & Johnson, 1997). Activities within this level of intensity may include badminton, golf, walking, softball, weight training, gardening, biking and recreational tennis.

In an attempt to catagorize the various intensities of physical activity, Terbizan and Strand (1998) described the Adult Activity Pyramid. The pyramid is divided into five zones as shown below and each zone is based on percentages related to a persons maximum heart rate (MHR).

- Weight Management Zone. Physical activity with a heart rate range of 40%-50% of (MHR).
- Heart Healthy Zone. Physical activity with a heart rate range of 50%-70% of MHR.
- Aerobic Zone. Physical activity with a heart rate range of 70%-85% of MHR.
- Intense Conditioning Zone. Physical activity with a heart rate range of 80%-95% of MHR.
- Red Zone. Physical activity with a heart rate range of 90%-100% of MHR.

The purposes of this study were (1) to determine the difference in heart rates among marching band members who play instruments of different weights, (2) to determine the amount of time band members spent in each zone of the Adult Activity Pyramid, and (3) to determine if marching band members, during practice, obtained 30 minutes of moderate intensity physical activity on a daily basis.

Methodology

Subjects

Sixteen members, 14 male and 2 female, ranging in age from 18 to 23 years, of a university marching band, participated on a volunteer basis. All subjects signed an informed consent and were able to withdraw from the study at any time. The University Institutional Review Board granted approval prior to the start of the study and marching took place in the late afternoon, outdoors on an asphalt parking lot.

Instrumentation

Marching Cadence. The marching band utilized a Corps style of march, which is an eight-to-five step with eight steps to cover five yards (covering 22.5 inches in each step).

Heart Rate Monitor. Polar Vantage XL heart rate monitors (HRM) were used to collect heart rate data. Data were collected in five second intervals and downloaded into a computer to be analyzed.

Adult Activity Pyramid. The target zones were calculated for all subjects based on their resting heart rates and ages. The Karvonen formula was used to determine individual heart rate target zones. The target zones were derived by taking a percentage of the difference between an individual's maximum heart and resting heart rate and adding this to his or her resting heart rate. This calculation was done for each of the five Activity Pyramid zones. The target zones were set on the Polar analysis software, and the amount of time was calculated for the time spent in the zone.

Methods

The 16 subjects were divided into two groups. The heavy group, with seven subjects, consisted of individuals carrying instruments of five pounds and greater while the light group, with nine subjects, was made up of individuals carrying instruments weighing less than five pounds. Instruments ranged in weight from 3 to 25 lbs. Each of the subjects was given a numbered HRM that was used throughout the study. Prior to data collection, the researcher met with all subjects collectively to explain the operation of the heart rate monitors. At this meeting the researcher collected personal information, including the age and resting heart rate of each subject. These data were used to determine the target zones of each individual.

Data were collected throughout an entire week, with groups of four to five people at a time. Seventeen heart rate recordings were collected from subjects. One recording was discarded because of a malfunction in the equipment. On the days when heart rate data were collected, the researcher assisted the subjects in putting on the heart rate monitors. The monitors had already been pre-programmed, and the limits were set for the heart rates. Heart rates were recorded at five-second intervals. Once subjects were ready to begin, they all started recording data by pressing the 'start" button. A check was taken of all watches and monitors to make sure all were working and recording data. When practice began, the researcher announced to the subjects to press the "store" button. This announcement marked the time that practice started. The wrist receiver was covered with a wristband, and auditory beeping was turned off. Rather than have the subjects note all actions, the researcher took notes on what they were doing throughout the session. When practice was over, the subjects pressed the "stop" button and monitors and watches were collected and downloaded. If there were any problems related to data collection, the same procedure took place two days later, and new data were collected.

All of the practices were generally the same in routine, with slight differences in break times. The practices, one hour and fifteen minutes in length, began with a group warm-up (five minutes) where subjects stood and played their instruments with the rest of their section. The remainder of the practice time was spent marching and playing their instruments, with an occasional break (30 seconds to 1 minute) to fix formations and alignment. During the marching

drill for the week of this study, the band performed a swing theme. For a brief time (30 seconds to 1 minute), the entire band danced in a swing-like manner. One other unique aspect to the drill of the week was that they had a scatter drill. This drill consisted of the band members "scattering" or running to another spot on the field. This happened one time per practice sessions and marchers had 16 counts to get to their new spot.

Statistical analyses were performed using GB-Stat and Polar analysis software (Polar Electro, 1993). Mean heart rates for subjects carrying heavy and light instruments were calculated and compared in an analysis of variance to determine if there was a statistical difference between the two groups. An alpha level of .05 was used to determine if the difference in heart rates was significant between the heavy and light groups. The resting heart rates of each subject were used to determine the target zone on the Activity Pyramid.

Results

Research question 1 sought to determine the difference in heart rates among marching band members who play instruments of different weights. Means and standard deviations of highest and average heart rates for the group carrying heavy instruments and the group carrying light instruments are reported in Table 1. As noted, the mean highest heart rate and mean average heart rate were higher for subjects with heavy instruments.

Table 1. Highest and average heart rate in beats per minute by group

Groups	Highest Heart Rate		Average Heart Rate	
	Mean	SD	Mean	SD
Heavy Instruments	170.71	17.55	106.57	10.47
Light Instruments	154.22	11.47	97.11	9.51

The Analysis of Variance by groups (heavy and light instruments) was conducted using mean highest heart rate and mean average heart rate as dependant variables. The p value when comparing the mean highest heart rates for each group was 0.0404. This indicates a statistically significant difference in the mean highest heart rate of the two groups. When comparing the mean average heart rates of the two groups, the p-value of 0.0553 indicates no statistically significant difference.

Research question 2 sought to determine the amount of time band members spent in each zone of the Adult Activity Pyramid. The mean time that the activity level of subjects of both the heavy and light instrument groups fit into the different zones of the Activity Pyramid is shown in Table 2.

Table 2. Mean time in minutes by groups in zones of the Activity Pyramid

Activity Pyramid Zone	Heavy Instrument	Light Instrument
Weight Management	7.7	4.4
Healthy Heart	1.8	3.9
Aerobic	0.1	0.2
Intense Conditioning	0.0	0.0
Red	0.0	0.0
Total Time in Zones	9.6	8.5

Subjects carrying heavy instruments had a daily mean of 7.7 minutes in the Weight Management Zone, 1.8 minutes in the Heart Healthy Zone and 0.1 minute in the Aerobic Zone. Subjects carrying light instruments had a daily mean of 4.4 minutes in the Weight Management Zone, 3.9 minutes in the Heart Healthy Zone, and 0.2 minutes in the Aerobic Zone.

Research question 3 sought to determine if band members, during marching band practice, obtained 30 minutes of moderate intensity physical activity on a daily basis. Subjects carrying

heavy instruments obtained moderate intensity physical activity for 9.5 minutes daily while subjects carrying light instruments obtained moderate intensity physical activity for 8.3 minutes daily.

Discussion

In some school districts, administrators allow marching band, among other things, to replace required physical education credits (National Association for Sport and Physical Education, 2002). Although marching band members often spend several hours a week practicing and practices normally consist of marching and carrying an instrument for over an hour at one time, the health benefits of marching band have not been explored.

In this study, subjects did not reach the recommendation of 30 minutes of moderate intensity physical activity daily as suggested by the U.S. Surgeon General (U.S. Department of Health and Human Services, 1996). On average, the subjects spent 6.0 minutes in the Weight Management Zone, 2.85 minutes in the Heart Healthy Zone and 0.15 minutes in the Aerobic Zone, for a total of approximately 8.85 minutes of at least moderate intensity physical activity. In essence, subjects spent approximately 66 minutes in a 75 minute practice session with heart rates below a moderate intensity level of 40% of maximum heart rate.

It is well accepted that physical education addresses three domains, affective, cognitive and psychomotor, and some would list a fourth, fitness. When activities such as rodeo, marching band, cheerleading, and interscholastic sports are used to replace physical education credits, the true value of physical education can not be realized. Although some of the mentioned activities may provide learning experiences in one or more of the domains, those experiences may not be germane to physical education. For example, in marching band students certainly develop psychomotor skills such as being able to march and play an instrument at the same time but that is not remotely related to the types of psychomotor skills developed in physical education.

We would also argue that marching band does not and can not impact the affective and cognitive domains similar to that which is happening in physical education. This is not to say that marching band does not impact those two domains, it does. It simply does not affect those two domains like physical education does. In essence, each activity provides unique benefits and one can not be used to replace the other.

And finally, fitness benefits. Since marching band does involve movement it can be classified as physical activity. However, if one compares heart rate intensities obtained through physical education activities with those obtained through marching band, that could also be questioned. Strand and Reeder (1993a) found that middle school students were above their 60% MHR for approximately 13 minutes in 35 minute class periods. In a second study the same researchers found that students were above their 60% MHR for 17.6 minutes (Strand & Reeder, 1993b). This compares to less than one-half of a minute for band members in this study. Similarly, Hannon and Pellett (1998) found that high school students were above their 40% MHR for approximately 21 minutes in 30 minute class periods. This compares to about nine minutes for band members who were engaged in 45 more minutes of activity.

In summary, marching band practice, during a slightly longer than a one hour long session, does not appear to provide a person enough physical activity to be in compliance with the Surgeon General's suggestion. In light of these findings, one can truly question the value of replacing physical education credits with marching band.

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