

Purpose of the Study

The purpose of this study was to examine time spent in a target heart rate zone during a cup stacking unit for 4th grade students in Grundy Center.

Delimitations

This study was delimited to:

1. Intact 4th grade classes in Grundy Center taught by the regular physical education teacher.
2. An 8 day cup stacking unit.
3. Thirty-eight 4th grade boys and girls were the participants.
4. Heart-rate monitors were used everyday in the Physical Education classroom.

Limitations

The following are limitations for this study:

1. Maximum effort was not given by the participants.
2. Relatively small sample size.
3. Heart rate monitors occasionally do not make good contact with the skin resulting in no heart rate data.
4. Heart rate can be influenced by other factors such as emotional stress and body position.

Assumptions

The following assumptions are identified for this study:

1. The research participants complied with the instructor's instructions to give maximum effort during the cup stacking activities.

2. The heart rate monitors were a valid and reliable measure of heart rate in the research participants.

RESULTS

The purpose of this study was to examine the amount of time participants spent in a target heart rate zone during a cup stacking unit. Data taken from PE Manager were entered into The Statistical Package for the Social Sciences (SPSS). Specifically, time spent below target zone, in target zone, above target zone, and heart rate for each student was entered into SPSS. The mean and standard deviation for time spent below target zone, in target zone, above target zone, and average heart rate was computed for the sample (see Table 1).

Table 1

Averages of Minutes Spent in Specific Target Zones and Heart Rate in Beats per Minute

Variable	Mean	Standard Deviation	Percentage of Class Time
AVERAGE BELOW ZONE	13.45	4.64	33.63
AVERAGE IN ZONE	17.34	4.26	43.35
AVERAGE ABOVE ZONE	2.89	1.93	7.23
AVERAGE HEART RATE	138.70	10.33	

Note. Percentage of class time will not add up to 100% because of the variability within the data set.

With the target heart rate zone set from 125-190 beats per minute, the average time participants spent in the target zone was 17.34 minutes with the average heart rate at 138.7 beats per minute.

Although not the primary purpose of the study, an exploratory analysis was conducted to examine any gender differences. An independent samples t-test showed that girls spent more time in the average target zone than boys $t(36) = -2.22, p = .033$. The mean time in the average target zone for boys was 15.96 minutes with a standard deviation of 4.30. On average, girls spent 18.88 minutes in zone with a standard deviation of 3.75.

Summary

Thirty-eight participants completed the questionnaire and participated in the cup stacking unit. The results suggest there is a positive association with cup stacking and gaining cardiovascular benefits when the lessons are designed specifically for this purpose. The majority of class time was spent in the target heart rate zone, the average being 17.34 minutes. The average heart rate during the cup-stacking unit was 138.7 beats per minutes. The cup stacking activities used in this study were able to allow students to gain cardiovascular benefits from them because they were engaged in the target heart rate zone for an extended period of time.

Summary, Conclusion and Recommendations

The problem of the study was to examine the length of time spent in a target heart rate zone during a 4th grade cup stacking unit. The participants of the study were 38 male and female 4th grade physical education students enrolled at Grundy Center Elementary School during the 2004-2005 school year. All participants completed a questionnaire before the study began to determine demographic data. All participants wore Polar heart rate monitors to collect heart rate data. The data were collected during the months of April and May, 2005.

SPSS software was used for all statistical analysis. Descriptive statistics were used to find average times below, in and above the target heart rate zone. Average heart rate was also found. An independent samples t- test was used to determine the differences between gender and amount of time spent in target heart rate zone.

The analysis of the data revealed the following conclusions. First, the cup stacking lesson plans used during this study allowed students to remain in the target heart rate zone enough time to be beneficial to their heart and to gain cardiovascular benefits. Second, females spent more time in the target heart rate zone than males spent in the same target zone. From this study, cup stacking was found to be an aerobic activity if lessons are set up properly. As previous research has concluded, cup stacking works on hand-eye coordination as well and should be a unit taught in the physical education curriculum.

The following recommendations are made for further research in the area of cup stacking and heart rate monitoring. Because of the relatively small sample size in the current study, this study should be replicated using a larger sample size and a longer cup

stacking unit. Additionally, the current study examined heart rate during a cup stacking unit. It would be interesting to examine the heart rate of students during individual cup stacking activities to determine which activities are the best cardiovascular workouts for the heart. Researching genders and their heart rates specifically while they participate in the same cup stacking activities to note if there would be any similarity or differences with heart rate would be another interesting study.