

High School Physical Education Students' Heart Rates During Different Activities

What Was the Question?

Researchers have found that different types of activities taught in physical education demonstrate a wide range of intensities, with team games eliciting the highest percentage of moderate-to-vigorous physical activity (MVPA), followed by individual activities, individual games, and movement activities. Several studies have shown a difference between the intensity of physical activity during physical education for boys compared to girls, although prior research has primarily focused on elementary and middle school programs. Laurson, Brown, Cullen, and Dennis (2008), citing recent calls for schools to assume leadership roles in promoting physical activity, examined the intensity of different types of high school physical education activities by measuring students' heart rate responses. A secondary purpose was to identify how these responses vary by gender and grade level.

What Was Done?

The study included 796 students (423 boys and 373 girls) from co-educational high school physical education classes (127 freshmen, 207 sophomores, 271 juniors, and 191 seniors) in Central Illinois. Students enrolled in team or individual physical activity classes for the school year, but the school district allowed first-year students to participate only in fitness activities. Team classes included traditional skill-related sports and games, while individual activities included traditional games and sports that did not divide students into teams. Fitness activities were designed for health enhancement and lifetime fitness.

Monitors that record heart rate at 15-second intervals were used

to calculate the time spent in the target heart-rate zone and total exercise time. The lesson activity, mean heart rate (MHR), time spent in target zone, total activity time, and student gender, age, and grade were recorded immediately after each activity period (maximum 30 minutes). Activity classification was based on Healthy People 2010 (HP2010) objective 22-10, which states that students must spend 50 percent or more of their activity time in MVPA. As defined for this study, MVPA was greater than 50 percent of the age-predicted maximum heart rate, calculated by the formula $208 - (.7 \cdot \text{age})$.

What Was Found?

The 127 first-year participants' data were used only for descriptive statistics since the district limited their enrollment to fitness activities. The 2 (gender) x 3 (grade) x 3 (activity) ANOVA for MHR revealed no main effect for grade or gender, but did detect a significant main effect for activity type. Post hoc analysis indicated that MHR was significantly higher for fitness activities (142 ± 17 bpm) than team (117 ± 24 bpm) and individual activities (114 ± 18 bpm). Significant differences in boys' and girls' MHR during team versus individual activities were also found. A significant main effect was detected for percent of time spent above the threshold heart rate (% zone) by activity type. Post hoc analyses revealed that all three activity types were significantly different in % zone (fitness, 81.7%; individual, 68.4%; team, 60.6%).

What Does the Study Mean?

Both boys and girls had their highest MHR and time spent in the target heart-rate zone during fitness activities. A higher MHR was achieved by boys during team activities and by girls during

individual activities. Fitness activities consistently elicited more time spent in MVPA than team or individual activities regardless of gender. Therefore, these findings indicate that fitness activities are the most efficient activities for improving cardiovascular endurance in high school physical education.

This study also addressed the issue of the American College of Sports Medicine's recommended intensity level for cardiovascular training for this age group. Using MHR by activity, the following activities met the 60–90% age-predicted maximum heart-rate zone in the present study: dance (all forms), Ultimate, jump rope circuit, fitness kickball, aquatics, cardiolab (treadmills, recumbent and upright cycles), running and walking, cardio circuit (cardiovascular activities performed in sequence with little or no equipment), interval training on gym bleachers, and cross-country running.

This study also evaluated whether physical education classes met the HP2010 objective that at least 50% of class time be spent in MVPA. Based on threshold heart-rate levels by activity, all activities except for volleyball and golf were considered "successful" in reaching the HP2010 objective.

Reference

- Laurson, K. R., Brown, D. D., Cullen, R. W., & Dennis, K. (2008). Heart rates of high school physical education students during team sports, individual sports, and fitness activities. *Research Quarterly for Exercise and Sport*, 79, 85-91.

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