

Heart Rate Responses of High School Students Participating in Surfing Physical Education

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Abstract

Background: Despite the nation's rising epidemic of childhood obesity and diabetes, schools struggle to promote physical activities that help reduce risks for cardiovascular disease. Emerging data suggest that adopting novel activities into Physical Education (PE) curriculum may serve as an effective strategy for increasing physical activity in children. **Purpose:** The purpose of this study was to test the hypothesis that high school students participating in a novel PE curriculum (surf PE) would meet the American College of Sports Medicine's duration and heart rate (HR) recommendations for cardiovascular fitness and health. **Methods:** Twenty-four male (n=20) and female (n=4) high school students (mean age=16.7±1.0yrs) that were enrolled in surf PE courses at two San Diego County High Schools participated in this investigation. Daily measurements of surfing durations, average HR, and maximum HR were made on the students with HR monitors (Polar FT1). In addition, HR and activity in the water was evaluated once over the course of the class in a subset of students (n=11) using a HR monitor (Polar RCX5) and a video camera (Canon HD). Activity and HR were synchronized and evaluated in 5-second intervals during data analysis. **Results:** The average duration that PE students participated in surfing during class was 61.7±1.6min. Paddling, wave riding, sitting or lying, and miscellaneous activities comprised 36.7±2.4, 2.9±0.4, 42.7±2.9, and 17.8±3.5% of the time, respectively. The average and maximum HRs during these activities were 131.1±0.9 and 177.2±1.0bpm, respectively. **Conclusion:** The data suggests that high school students participating in surf PE obtained heart rates and durations that are consistent with recommendations with cardiovascular fitness and health. In the future, physical education programs should consider incorporating other action sports into their curriculum to enhance cardiovascular health.

Background

- Research into reducing risk for obesity and diabetes has flourished as these diseases have become more prevalent in adolescence (Buchan, 2010).
- Current recommendations by the ACSM recommend that children should participate in ≥60 minutes of moderate physical activity each day as part of maintaining cardiovascular health (Andersen, 2006 & Nader, 2003).
- Few recommendations to increase physical activity have been made for children within school settings (Kahn, 2002 & Kremer, 2012).
- Physical education classes could have a more significant contribution to the students' level of activity by adopting novel activities into their curriculum (Fernandes, 2010 & Kremer, 2012)
- Surfing is a well-established aerobic activity but there is no evidence regarding the effects that surfing physical education has on reducing risk for cardiovascular disease.

Purpose

The purpose of this study was to test the hypothesis that high school students participating in a novel PE curriculum (surf PE) would meet the American College of Sports Medicine's duration and heart rate (HR) recommendations for cardiovascular fitness and health.

Methods

Subjects

- Twenty-four high school students, male (n=20) and female (n=4), enrolled in surfing physical education course participated in this study.
- Ages of participants ranged between 15-18 years.
- Consent, health history questionnaire, and surfing history forms were completed by parents and students prior to participation.

Protocol

- Data was collected during the 2014 Spring semester
- Average HR, max HR, and duration were assessed daily in all subjects using Polar heart rate monitors (Polar FT1) while surfing.
- HR and activity were assessed simultaneously over a single surf session using a HR monitor (Polar RCX5) and a video camera (Canon HD) in a subset of students (n=11).
- Surfing activities were classified as stationary, paddling, wave riding, and miscellaneous.
- Activity and HR were synchronized and evaluated in 5-second intervals during data analysis.

Statistical Analysis

- All data is presented as mean ± SE.

Overall Results

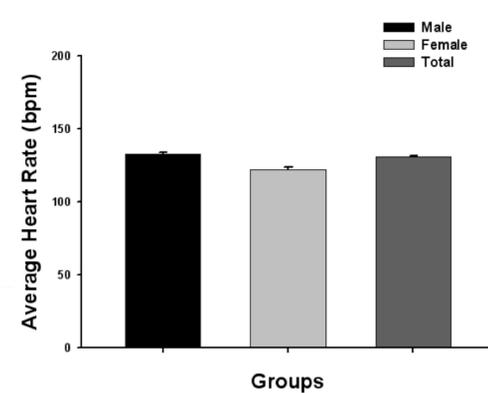


Figure 1. Average heart rate data between male, female, and total subjects.

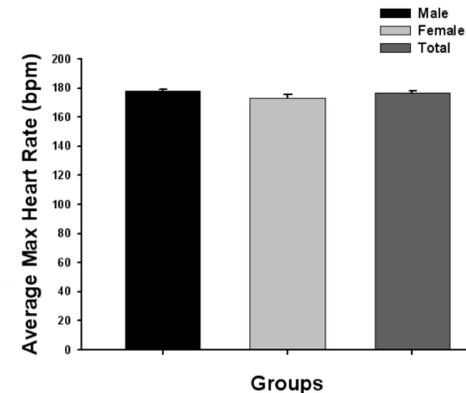


Figure 2. Average max heart rate data between male, female, and total subjects.

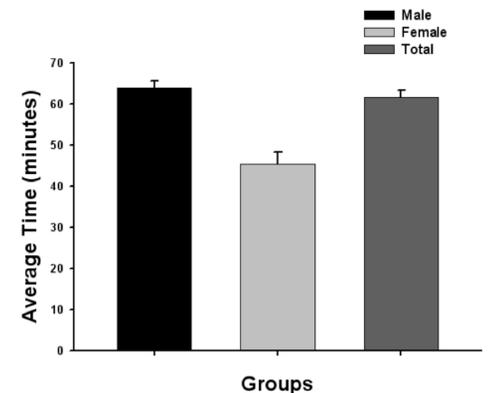


Figure 3. Average session duration between male, female, and total subjects.

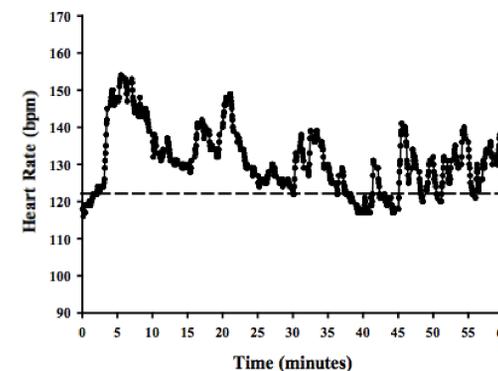


Figure 4. Representative heart rate data during a single surf session. Dashed line at 122bpm represents lower limit of moderate intensity heart rate range

Subgroup Results

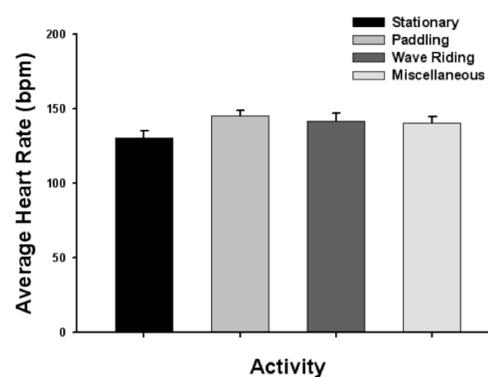


Figure 5. Average HR during each activity i.e. stationary, paddling, wave riding, and miscellaneous

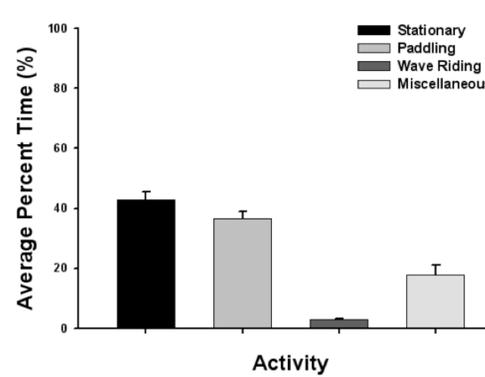


Figure 6. Average percent time spent during each activity i.e. stationary, paddling, wave riding, and miscellaneous

Characteristic Results

Total Subjects	n	Age	Height (m)	Weight (kg)	Years Surfing	Hrs Surfing/Wk
Male	20	16.7±0.2	1.76±0.02	67.8±2.2	5.0±0.6	13.3±1.8
Female	4	16.5±0.6	1.63±0.03	54.6±3.2	5.5±1.8	7.5±1.4
Total	24	16.7±0.2	1.74±0.02	65.6±2.2	5.0±0.6	12.3±1.5
Subgroup	n	Age	Height (m)	Weight (kg)	Years Surfing	Hrs Surfing/Wk
Male	8	16.8±0.5	1.81±0.03	65.3±3.8	4.6±1.2	8.8±1.4
Female	3	16.7±0.9	1.65±0.03	57.1±2.7	4.0±1.5	7.0±1.5
Total	11	16.7±0.4	1.77±0.03	63.0±3.0	4.5±0.9	8.3±1.1

Table 1. Summary of subject characteristics expressed in mean ± SE.

Conclusions

- The average heart rate (131 ± 0.87bpm) of students participating in a high school surfing physical education curriculum is consistent with heart rate recommendations for cardiovascular fitness and health (Figure 1).
- The average exercise duration (61.7 ± 1.6min) of students participating in a high school surfing physical education curriculum is consistent with duration recommendations for cardiovascular fitness and health (Figure 3).
- The average heart rate during paddling, wave riding, miscellaneous activities, and stationary were 145.0 ± 3.9, 142.0 ± 4.8, 140.6 ± 4.2, and 130.6 ± 4.7, respectively (Figure 5).
- Paddling, wave riding, miscellaneous activities, and stationary comprised 36.7 ± 2.4, 2.9 ± 0.4, 17.8 ± 3.5, and 42.7 ± 2.9% of the time, respectively (Figure 6).

References

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