2009-01-01

Evaluation of Selected Physical Activities on Maintenance of Target Heart Rate in Hispanic Middle School Students

Christopher Ray Estrada
University of Texas at El Paso, chris.estrada@laspalmashealth.com

EVALUATION OF SELECTED PHYSICAL ACTIVITIES ON MAINTENANCE OF TARGET HEART RATE IN HISPANIC MIDDLE SCHOOL STUDENTS

CHRIS ESTRADA

Department of Kinesiology

APPROVED:

Rockie Pederson, Ph.D., Chair

Harry Meeuwsen, Ph.D.

Carolyn Awalt, Ph.D.

Patricia D. Witherspoon, Ph.D.
Dean of the Graduate School

EVALUATION OF SELECTED PHYSICAL ACTIVITIES ON MAINTENANCE OF TARGET HEART RATE IN HISPANIC MIDDLE SCHOOL STUDENTS

by

CHRIS ESTRADA, BS

THESIS

Presented to the Faculty of the Graduate School of

The University of Texas at El Paso

in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF SCIENCE

Department of Kinesiology

THE UNIVERSITY OF TEXAS AT EL PASO

May 2009

ACKNOWLEDGEMENTS

I would like to thank the El Paso Independent School District for approving this study and allowing us to conduct this research at Guillen Middle School. I would like to thank Mr. Don Disney for his cooperation, continued effort and support for this study. I also thank Julia Bader in the Department of Mathematical Sciences as Research at the University of Texas at El Paso who assisted in analyzing the data. This fieldwork was carried out by Manny Padilla, David Flores, Coach Tony Huerta, and Coach Mark Gutierrez. I would also like to express my appreciation to James Lawler (principal at Guillen MS), the physical education staff, and the students who graciously volunteered for this study. I'd also like to express gratitude to Dr. Rockie Pederson who has helped me with my journey. You've taught me that in order to lead you must first learn how to follow. And lastly, I would like to thank my wife Christy and my children Sky, Deuce, and Adyenn for letting daddy concentrate on his "homework" and being supportive in the matter. This was never about "me" it has always been about "us" completing this thesis.

ABSTRACT

This was an evaluation of the Polar "Borderland Heartbeats for Healthy Living" grant. PURPOSE: To determine which physical activities maintained middle school students' Time In Target Heart Rate Zone the longest and which physical activities facilitated student improvement on selected FITNESSGRAM assessments (weight, BMI, PACER, Push-ups, and Curl-ups). METHODS: Participants were 63 students (34 female, 29 male: age *M* =13.2 years, *SD* 0.70; height *M* = 157.96cm, *SD* 0.96; weight *M* = 58.90kg, *SD* 35.32; and BMI *M* = 22.79, *SD* 4.77) enrolled in four intact 7th grade physical education classes. Intact classes were randomly assigned to a condition (Aerobic-Resistance (AR), Current Curriculum (CC), Resistance Training (RT), and Aerobic Activities (AA) for 10 weeks. RESULTS: Percent of Time In Target Heart Rate Zone was significant ($F = 3.62$, $p = 0.0069$). Tukey's Studentized Range Tests revealed significance difference ($F = 4.46$, $p = 0.0069$) between AA and CC conditions only. AA averaged 58% percent, while AR averaged 52%, CC averaged 42%, and RT averaged 49% respectively. FITNESSGRAM analysis revealed significant Group by Time Interactions for Weight ($p = 0.0014$), BMI ($p = 0.0002$), PACER ($p = 0.0245$), and Push-up ($p = 0.0097$) assessments. AR condition showed significant increases in weight ($p = 0.0345$, + 4.71 lbs), BMI ($p = 0.0121$, + 0.80), curl-ups ($p = 0.0026$, + 14.35 repetitions), and push-ups ($p = 0.0051$, + 4.42 repetitions). CONCLUSION: There was a significant difference in Percent of Time in Target Heart Zone between AA and CC conditions only. FITNESSGRAM Pre-data suggested that the physical assessment parameters may have been well designed but not adequately implemented. Further research examining the relationship between fitness activity conditions and fitness thresholds in middle school setting is needed.

TABLE OF CONTENTS

ACKNOWLEDGEMETS……...…..iv

ABSTRACT…….....v

TABLE OF CONTENTS……vi

LIST OF TABLES……..……vii

LIST OF GRAPHS…….viii

INTRODUCTION…….....1

METHODS.....7

Participants.....…….7

Study Protocol……...…….……...……...8

Data Collection……..11

Statistical Analysis…….11

RESULTS……..12

Descriptive Statistics……...……..13

DISCUSSION……..……...……..15

Strengths……...……...……...…17

Limitations and Future Research.……..18

CONCLUSIONS……..……..…...……21

REFERENCES……...…...…….....22

APPENDICES

APPENDIX A: EPISD and UTEP Letter of Approvals……....31

APPENDIX B: LITERATURE REVIEW……...……33

APPENDIX C: PARENT CONSENT /PARTICIPANT ASSENT FORM…….77

APPENDIX D: POLAR PRESENTATION FORMS…….....85

APPENDIX E: SAMPLE LESSON PLAN…….91

CURRICULUM VITA…….....……92

LIST OF TABLES

Table 1 Participants' Demographic Statistics……..……..…….33

Table 2 Percent of Time, Total Time, and Daily Mean Time for Time In Target Heart Rate Zone…….…..33

Table 3 Effects of Polar's Borderland Heartbeats for Healthy Living Interventions on Health –Related Fitness Measures: Results of ANOVA……...34

LIST OF GRAPHS

Graph 1. Daily Mean Time In Target Heart Zone across the 10 days for each condition…35

INTRODUCTION

Adolescence is a period of rapid change and physical growth accompanied by profound emotional and psychological changes (Fairbrother, Jones, & Hitchen, 2005). Middle school students are at an age and in a setting that offers great potential for effective and efficient interventions (Frenn & Malin, 2003). For some adolescents, physical education class provides the only opportunity to exercise and to acquire the benefits of physical activity (Mitchell, Strasburger, & Donkin-Kursar, 2001). Adolescents spend approximately one-third of their time in the school environment. As a result, schools have direct control over the duration and intensity of physical activity that students engage in. The establishment of regular physical activity patterns during adolescence remains important for immediate gains in health and well-being and to develop positive behaviors that can be developed throughout life (Dwyer, Allison, Goldenberg, Fein, Yoshida, et al., 2000).

As a component of the public school curriculum, physical education has received increased attention relative to addressing the inactivity of adolescents (Grissom, Ward, Martin, & Leenders, 2005). Physical education has been identified as the content area best positioned to address the health related physical activity needs of all public school students (Sallis & McKenzie, 1991). However, the amount of physical activity middle school students engage in during physical education classes falls short of the National recommendation of approximately 60 minutes per day of organized extracurricular physical activity (U.S. Department of Health and Human Services, 2008). Information about adolescents' physical activity levels indicated that most adolescents were not sufficiently active to attain optimum health levels (Frenn, Malin, Bansal, Delgado, Greer, et al., 2003).

Traditionally sport and competition oriented activities such as football, soccer, and

basketball have dominated physical education. This approach identified participants as "winners and losers" (Ryan, Fleming, & Maina, 2003). Relatively few adolescents continued to engage in competitive sports during adulthood (Mohr, Townsend, & Pritchard, 2006). Objectives related to the importance of health outcomes such as cardiovascular fitness, body composition, muscular endurance, and flexibility have not been emphasized in physical education (Pate, Davis, Robinson, Stone, McKenzie, et al., 2006). This lack of emphasis resulted in no individualization of exercise intensity to the capacity of each adolescent during physical education (Baquet, Berthoin, & Praagh, 2002).

Twenty to 50% of adolescents participated in insufficient daily physical activity and 6-12% participated in little or no moderate-to-vigorous physical activity (MVPA) on a daily basis (Corbin, Pangrazi, & Le Masurier, 2004). Physical activity levels declined 26-37% during adolescence: 85% of middle school students reported participating in less physical activity by the time they reached high school (Aaron, Stori, Robertson, Kriska, & La Porte, 2002). Shane (2006) concluded that physical activity levels peaked between ages 10 through 13. In 2004-2005, the prevalence of childhood obesity in Texas (32.4%) was greater than the United States rate (30.6%) reported in the 2003-2004 National Health and Nutrition Examination Survey (NHANES) (Ogden, Carroll, & Curtin, 2006). Despite the physical education requirement in public schools, sizeable percentages of youth failed to meet established guidelines for participation in physical activity (Trost, Saunders, & Ward, 2002).

The physical education requirement for Texas middle school students was established by Senate Bill 530 passed in May 2007 (State Legislature of the State of Texas, 2001). Beginning with the 2008-2009 school year, sixth-eighth grade students must participate in MVPA four out of the six semesters and complete the annual FITNESSGRAM fitness test. Physical activity is

defined as any bodily movement resulting in energy expenditure. Dissected, physical activity has four dimensions: frequency (number sessions per unit time), intensity (rate of energy expenditure, adjusted for body size), time (minutes, seconds) and type (a qualitative descriptor of the activity) (Verschuur & Kemper, 1985). Of the four dimensions, measuring the intensity of physical activity performed by an individual has been largely a difficult goal for educators to achieve.

However, the accurate measurement of adolescents' activity levels remained generally difficult due to the sporadic nature of its occurrence (Welk & Corbin, 1995). A true picture of habitual physical activity for this age group requires the monitoring of intensity, duration, frequency, and the method of activity for extended periods of time. Any tool selected to assess adolescents' physical activity should avoid impeding the individual with awkward equipment, be socially acceptable, and minimally manipulate the adolescent's usual physical activity pattern.

Both subjective measures and motion sensors (accelerometers, pedometers, and heart rate monitors) have been used to assess student physical activity levels. Subjective measures (direct observation and questionnaires) have been used in school systems to measure the behavioral aspects of physical activity in large populations (Welk, Corbin, & Dale, 2000; Hussey et al., 2007). This approach was well suited for the studies on adolescents. However, drawbacks of direct observation included high experimenter burden and the potential reactivity of the students to the presence of the observer (Puhl, Greaves, & Hoyt, 1990). The method used most often with this age group as physical activity questionnaires. However, questionnaires could not easily classify the spontaneous, non-organized activities that many adolescents participated in (Hussey, Bell, & Gromley, 2007).

Motion sensors such as pedometers, accelerometers, and heart rate monitors have been

used to measure physical activity patterns in adolescents. Pedometers measured ambulatory movements common to children and adolescents while ignoring other modes of physical activity. Some pedometers have the capacity to assess the intensity of the activity (Corbin, et al., 2004). The accelerometer was also limited in assessing movements and had issues with underestimation of energy expenditure during daily living and static activities (Ham, Reis, Strath, Dubose, & Ainsworth, 2007). The heart rate monitor was the most successful field measure used by physical educators and researchers to measure physical activity levels(Kohl, Fulton, & Caspersen, 2003). They provided precise details about the frequency, intensity, duration, and time of day of individual episodes of physical activity and estimated daily energy expenditure (Claytor, Horn, & Iannotti, 2004).

Recently, technology grants provided physical education programs the opportunity to purchase heart rate monitors for students' use in class (Welk, 2008). The intent was to hold the students accountable and to encourage them to exercise within their personalized target heart rate zone. A substantial amount of research has examined heart rate monitor use in adults in various settings but only few studies have examined its use in adolescents. Recently, physical education programs have used technology grants to purchase heart rate monitors for students (Welk, 2008). The concept was that the monitors hold students accountable and encourage them to exercise within their designated target heart rate zone.

The use of heart rate monitors in physical education settings has been examined with conflicting results. Janz, Golden, Hansen, and Mahoeny (1992) assessed the usefulness of whole-day monitoring of physical activity using heart rate monitors on 76 children and adolescents 6 to 17 years of age. A 12-hour recall and a self-rating physical activity questionnaire were administered on the same day. Results concluded that whole-day monitoring

was an objective, non-obstructive method for measuring physical activity and was an influential mediating factor for activity for adolescents. Activity measured by heart rate was significantly related to questionnaire recall (r = 0.50) and self-rating (r = 0.35) suggesting that heart rate monitoring was an appropriate measure of physical activity of children and adolescents.

The amount of time 11-14 year old students spent in their target heart rate range during an intensity-controlled 1 mile run was examined by (Mitchell, et al., 2001). Sixth, seventh and eighth grade students (n = 311) in daily physical education classes participated in the study. Students wore heart rate monitors and were instructed to keep their heart rate in a specified range (75% to 85% of max). Overall, the participants spent 67% of time in or above their heart rate range during an intensity-controlled 1 mile run. Teaching students to exercise within a heart rate range may promote fitness by emphasizing time in the heart rate range instead of placing emphasis on the fastest 1-mile run.

Conversely, Martin, Grissom, Ward, and Leenders (2003) had poor results with the use of heart rate monitors when the focus of lesson objectives was on maintaining moderate to vigorous physical activity for 50% of the class time. With the current public health emphasis on accumulating 60 minutes of moderate-intensity physical activity, objective methods of quantifying extended periods of physical activity must be validated (Freedson & Miller, 2000). Further research is warranted to determine if heart rate monitors are a reliable source of measuring physical activity levels in adolescents.

This study evaluated the “Polar’s Borderland Heartbeats for Healthy Living” (PBHHL) program in El Paso, TX funded by the NASPE/Polar Heart Rate Monitor Grant. The grant provided heart rate monitors and fitness equipment to expand a middle school physical education program and assist students in meeting the National Standards for Physical Education. The

objectives stated by the grant were: 1) all students in the Polar study were to improve on selected FITNESSGRAM tests; 2) help students recognize that heart rate monitors were an important technology tool for improving aerobic capacity and BMI; and 3) help students identify scientific principles within exercise physiology as an effective means to improve health and wellness. Our intent was to fulfill these objectives set forth by the Polar grant by the methods implemented in the study. The purposes of the study were; a) determine which physical activities kept students in their In Target Heart Rate Zone the most and; b) which physical activities facilitated improvement in selected FITNESSGRAM assessments (weight, PACER, max repetition push up, timed curl up, and BMI).

METHODS

Participants

Participants were 86 middle school students aged 12-15 years (41 female, 45 male: 98% Hispanic, 1% Caucasian, and less than 1% African American) enrolled in 4 intact seventh-grade physical education classes. Data from 23 students were discarded due to absences, changes in student schedules, and lack of participation in class and/or testing. Therefore, data on 63 students (34 females and 29 males) were used in this study. Prior to participating in the study, written participant assent and parental consent were obtained from each student. The procedures used in this study were reviewed and approved by the Institutional Review Board at the University of Texas at El Paso (UTEP) and the El Paso Independent School District (EPISD) Research, Accountability and Assessment Department.

Description of School and Participants. The middle school was located in 1 of the 3 poorest zip codes in the Nation. The 960 students in the school were predominantly Hispanic (98%). Fifty-four percent of the students were limited English proficient, 11% were immigrants, 13% were migrants, and 34% participated in Bilingual Education/English as a second language programs. For each student, stature and body weight were measured using a standard physician scale. Physical characteristics of the subjects (mean, SD, and range) are presented in Table 1.

Medical screenings conducted at the middle school by Adams (2005) concluded that 30% of the school's sixth graders had signs of a pre-diabetic condition. Health wise, students were a high risk population for type II diabetes due to predisposing factors affecting children and youth living on the Texas/Mexico border such as overweightness, ethnicity (Mexican-Americans), sedentary lifestyles, and economically disadvantaged status.

Study Protocol

"Borderland Heartbeats for Healthy Living" (PBHHL) was conducted over a 10 week period (4 weeks of orientation and 6 weeks of workouts-15 workouts total). The purpose of the 4-week orientation was to inform students about the study and introduce the purpose and use of heart rate monitors. Physical education class occurred 3 times one week and 2 times the following week according to the school's block schedule. Each class period was 75 min in length.

During the first week of orientation, a power-point presentation was used to present: a) general guidelines for the class; b) classroom rules; c) the use and purpose of the Polar heart rate monitors; d) proper care and maintenance of the monitors; e) types of activities to be implemented in class; and f) the benefits of physical activity, aerobic fitness and weight training. In the following 3 weeks, students practiced class routines for suiting out in class, putting on the heart rate monitor, and participating in workouts. Any questions and concerns raised by the students were addressed during the orientation phase.

Three student interns from a local university in their professional semester and 2 certified physical education teachers (with combined 19 years of experience) conducted the intervention conditions. The lesson plans for each condition included appropriate skill progressions and variations in intensities, duration, and activity. The first author worked closely with the interns and teachers to ensure lesson plans were implemented according to specific parameters identified in the grant. The lesson plans followed the guidelines set forth by the Texas Essentials for Knowledge and Skills (TEKS).

Each intact physical education class was randomly assigned to one of four conditions. The four conditions were: (a) Current Curriculum (CC); (b) Aerobic Activities (AA); (c) Resistance Training (RT); and (d) Aerobic-Resistance (AR). Each intern was randomly assigned

to implement the condition in the assigned physical education class under the supervision of the first author and certified physical education teacher (one intern had 2 conditions). The CC group (n = 14) continued with the current physical education program in place at the middle school. Units taught in the curriculum were soccer, volleyball, and basketball (2 week units each). Lessons plans included sport skills, sport strategy, basic concepts and rules, and small sided games. The AA group (n = 20) integrated a variety of aerobic-based activities including lifetime health-related activities, individual and team sports activities into the existing program. Aerobic activities included various forms of power walking, jogging, interval training, agility and conditioning drills, plus various dance and aerobic videos such as Tae Bo and kickboxing as mandated in the grant proposal.

The RT group (n = 14) participated in resistance training activities including free-weights, body weight exercises, plyometrics, theraband and medicine ball training. These activities were high in repetition following basic overload principles. The basic overload principle called for increased intensity, duration, and/or workload volume over a designated period (Mannie, 2004). The AR group (n = 14) participated in combined aerobic and resistance training activities. These activities were similar to the activities taught in both the aerobic and resistance training conditions. The equipment used in the 4 conditions were; (a) yellow and red therabands, (b) medicine balls (2lb, 4lb, and 6lb), (c) aerobic mats, (d) 6” and 12”hurdles, (e) agility ladders, (f) soccer balls, (g) lacrosse set, (h) jump ropes, (i) tug-a-war rope (75ft in length), (j) different colored pennies, (k) various aerobic DVD’s, (l) various sized cones, (m) basketballs, (n) abdominal wheels, and (o) kick balls.

Heart Rate Monitors

The use of heart rate monitors in laboratory and field settings has been shown to be a

valid way to measure heart rate intensity during physical activity (Leger & Thivierge, 1994; Treiber, Musante, Hartdagan, Davis, Levy, et al., 1989). Polar A600 heart rate monitors were used in the program. The monitor consisted of a chest transmitter on an adjustable, elastic chest strap and a wrist unit. The chest transmitter sensed the electrical impulses from the electrodes and sent the information to the wrist monitor. The wrist monitor contained a receiver-microcomputer which received and stored the heart rate recordings.

During physical education class, each student wore a specific monitor that was assigned to the student for the duration of study. At the beginning of class, each student acquired his/her assigned monitor from the carrying case. Students received instruction on how to wet the sensor-transmitters on the chest strap and positioning it properly on the chest. Paper towels and spray bottles with water were provided to moisten the monitor strap and skin to allow better conduction for the transmitter.

At the beginning of a typical physical education class, students suited out, put on the monitor, synced it and set it on "stand by". Students started their monitors as soon as the warm up portion of the class commenced. Immediate feedback through visual display and an auditory beep was provided by the monitor to the student when s/he was below or above the target heart rate zone. At the end of class, students recorded total exercise time and Time In Target Heart Rate Zone from the monitor in a personal training log. Teachers provided verbal feedback to students who were either below or above their training range zone. Students who were in their "Time In Target Heart Rate Zone were praised by teachers and students. Each student was responsible for returning the heart rate monitor back to the proper carrying case before leaving the class.

Time In Target Heart Rate Zone

The heart rate monitors were pre-programmed with a training zone lower limit of 136 beats per minute (65%) and an upper limit of 176 beats per minute (85%). This method has previously been used for establishing training limits in large groups (Strand & Reeder, 1993b). In adolescents, moderate activity such as brisk walking has shown to generate heart rates of about 140 beats per minute (Al-Nakeeb, Duncan, Lyons, & Woodfeild, 1997) and has been widely used as a general marker that accrues health benefits (Armstrong & Welsman, 1997; Armstrong, Welsman, & Kirby, 2000). The target zone limits were chosen since students were in the mean training zone limits of same-age subjects (age M =13.2 years old).

Data Collection

Each student's fitness level prior to the program beginning was assessed using the FITNESSGRAM. Each student completed the following assessments: height, weight, PACER, (Progressive Aerobic Cardiovascular Endurance Run), timed push up, modified sit up, and body mass index (BMI). The assessments were administered by the three interns and two physical education teachers. Post-fitness assessments were performed during the last scheduled week of the program.

Heart rate monitor data for each student in each condition were recorded at the end of each class period and downloaded from the wrist unit onto the physical education lap top (Compaq nc320 model) on a weekly basis. All data was saved on the lap top and only the student interns, physical education teachers, and first author had access to the data. Tri Fit software was used to convert student FITNESSGRAM scores and daily heart rate monitor recordings into files that could be read into Excel spreadsheets.

Statistical Analysis

For each variable: BMI, PACER, Curl-up, and Push-up (all Log transformed for

normality), the General Linear Mixed Model Analysis for repeated measures was used to test for Group effect (AA versus AR versus CC versus RT) Time effect (Pre versus Post) and Group by Time.

With a significant Group by Time interaction, tests of Effect Sizes to compare the Group means at Pre, the Group means at Post, and for each Group, Pre versus Post means were conducted. If the Group means at Pre or the Group means at Post were significantly different, Tukey's post-hoc procedure was used to further check where the differences in Group means lie (NOTE: These were additional tests and only the significant pairwise comparisons were included). The level of significance was set at 0.05.

Heart rate monitor data for each student in each condition was recorded at the end of each physical education class. The time In Target Heart Rate Zone was examined to determine which group had (a) the highest percentage of In Target Heart Rate Zone of total time and (b) the highest total time of In Target Heart Rate Zone. An ANOVA was used to determine if differences existed between the conditions and the time In Target Heart Rate Zone. With a significant ANOVA, Tukey's Studentized Range Test was used to further check where the differences in the four conditions lie. The independent variable (type of condition) included: current curriculum, aerobic activities, resistance training, and aerobic-resistance. The dependent variable was time In Target Heart Rate Zone. The level of significance was set at 0.05.

RESULTS

Descriptive Statistics

Percentage of Time In Target Heart Rate Zone. Percent of Time In Target Heart Rate Zone was significant ($F = 3.62$, $p = 0.0069$). Tukey's Studentized Range Tests revealed significance difference between AA and CC conditions (58% versus 42%, $F = 4.46$, $p = 0.0069$).

Total Time in Target Heart Rate Zone. Total Time in Target Heart Rate Zone was not significant ($F = 2.51$, $p = 0.0677$). Total time In Target Heart Zone for each condition over the 10 days was AA-193 minutes, AR- 200 minutes, CC- 155 minutes, and RT- 209 minutes.

Daily Average Time In Target Heart Rate Zone over the 10 days. Daily average Time In Target Heart Rate Zone over the 10 days was AA- 19 minutes, AR- 20 minutes, CC- 15 minutes, and RT- 20 minutes. Percent of time, total in zone time, and daily average Time In Target Heart Rate Zone is shown on Table 2. Daily mean Time In Target Heart Rate Zone over the 10 days is shown in Graph 1.

FITNESSGRAM.

Weight. Significant increase in Weight were seen for AR (p = 0.0345, + 11.71lbs) and significant decrease for AA (p = 0.0015, - 1.84lbs). No significant changes in Weight for RT and CC were recorded.

BMI. Significant increases in BMI were seen in AR (p = 0.0121, + 0.80) and significant decrease for AA (p = 0.0003, - 0.87). However, there were no significant changes in BMI for CC and RT.

PACER. Significant decrease in PACER was seen in RT (p = 0.0176, - 8.06 laps). However, there were no significant changes in PACER for AA, AR, and CC.

Curl up/ Push up. Significant increases in curl ups were seen in AR (p = 0.0026, 14.35 more curl-ups) and RT (p = 0.0041, 11.80 more curl-ups). No significant changes in Curl-ups were

seen in AA or CC. Significant increases in the Push-ups were seen in AR ($p = 0.0051$, 4.42 more push-ups) and RT ($p = 0.0003$, 6.0 more push-ups). No significant changes were noted for CC or AA. Results of ANOVA Fitness measures are shown on Table 3.

DISCUSSION

This study evaluated the Polar's Borderland Heartbeats for Healthy Living program funded by the NASPE/Polar Heart Rate Monitor Grant. The grant provided heart rate monitors and fitness equipment to expand a middle school physical education program and assist students in meeting the National Standards for Physical Education. The purpose of the study was to determine which physical education activity kept students in their In Target Heart Rate Zone the most and which activity facilitated improvement in selected FITNESSGRAM assessments.

For teens the Surgeon General has recommended 30 minutes of daily moderate physical activity; vigorous activity at least 3 days a week; and bouts of fitness exercises several days a week (Masurier & Corbin, 2006). Percentage of time In Training Heart Rate Zones revealed that Aerobic Activity and Aerobic-Resistance conditions were able to sustain percentages above 50% of total class time which meets the nation objective established in Healthy People 2000 (Healthy People 2000, 1991). These results supported other studies in which aerobic interventions were used to increase the percentage of total time in training zone (Strand & Reeder, 1993b; Quinn & Strand, 1995). However, all four conditions were unsuccessful in reaching either national or state standards of averaging at least 30 minutes of daily moderate physical activity and at least three days of vigorous physical activity weekly.

Youth and adolescents generally do not engage in "intense" or MVPA for extended periods (i.e. > 20 min) of time (Morrow & Freedson, 1994; Armstrong, 1998). Sustained high intensity activity was unlikely to be a part of the typical daily routine unless adolescents were training for a specific purpose (i.e. sports team) (Morrow & Freedson, 1994). Children and adolescents generally perform short bouts of MVPA and seldom participate in long periods of vigorous activity (Molnár & Livingstone, 2000).

Another potential cause of this may have been how the lesson plans were constructed and the content disseminated to the students. Grissom et al. (2005) concluded that physical education lessons were not constructed to keep students physically active at least 50% of the class time. A confounding factor was the trade-off between focusing on developing skill proficiency versus keeping students engaged in MVPA. Martin et al. (2003) suggested that the effectiveness of the teacher rather than heart rate monitors was responsible for student activity levels when the focus of lessons included skill and tactical skill development in addition to maintaining MVPA for 50% of the class time. Another factor impacting physical activity was block scheduling in which the physical education classes were held 3 times one week and 2 times the following week. This accounted for only 10 sessions in a two and a half month period. Collectively, these findings emphasize that daily physical education for adolescents will not appreciably increase the amount of activity they engage in unless a larger proportion of each physical education class is devoted to MVPA.

These results were similar to the results of Simons-Morton, Taylor, Snider, and Huang (1993) who evaluated the physical activity levels of 157 fifth-grade students in 20 of the 355 elementary schools in one district in Texas. On average, students spent 8.5% of class time in MVPA, 23.3% in minimal activity, and 68.1% in sedentary activity. None of students averaged 20% of class time in MVPA. Therefore, a new approach to teaching physical education is needed to motivate middle school students to participate in physical activity.

The Aerobic Activity condition demonstrated a decrease in Weight and BMI while the other three conditions maintained or slightly increased. This supports current research which has shown that aerobic exercise decreases body fat, BMI and increases aerobic performance (Klijn, Bann-Slootweg, & Van Stel, 2007). Aerobic-Resistance and Aerobic Activity students

demonstrated improved performance in the PACER while students in the Resistance Training demonstrated decreased performance. Increases in Push-ups were seen in both Aerobic-Resistance and the Resistance Training conditions. Over the past ten to fifteen years, ongoing research has provided convincing evidence that strength training can be a safe an effective method of conditioning for adolescents as long as appropriate guidelines are followed (Falk & Tenebaum, 1996). Regular participation in a cardiovascular and strength training program has the potential to positively influence flexibility, muscular endurance, and strength (Faigenbaum, Zaichkowsky, Westcott, Micheli, & Fehlandt, 1993). The Current Curriculum was unsuccessful in achieving gains on selected FITNESSGRAM tests and was not able to increase time In Target Heart Rate Zone. These results indicate that the current middle school physical education curriculum is not helping the students attain national and/or state physical activity norms.

Strengths

This study measured physical activity in an adolescent Hispanic population with the use of heart rate monitors. Previous studies with the same target population have used questionnaires to measure physical activity (Mier, Ory, Zhan, Wang, & Burdine, 2007). The study implemented a control condition to compare the current physical education curriculum versus three fitness-oriented conditions. The current physical education curriculum produced no significant improvements in any of the FITNESSGRAM tests and no increase in Time In Target Heart Rate Zone.

Schnirring (2005) performed a similar study in which two physical activity protocols were implemented with 50 adolescents. After baseline testing, students were randomly enrolled for a 9-month school year into one of two physical education protocols: standard physical education class or lifestyle focused fitness-oriented class. Both classes met 5 times every 2

weeks for 45 minutes. After 9-months, the intervention group showed greater improvements compared with the control group in body fat, cardiovascular fitness, and greater improvements in fasting insulin levels. The results of this study support Shnirring (2005) in that simple modifications in the physical education curriculum can produce measurable health benefits.

Limitations and Future Research

There were several limitations encountered during the study. First, imperfect methodology during pre-assessment resulted in significant differences in group means amongst the four conditions. Pre-data suggested that the physical assessment parameters may have been well designed but not adequately implemented. Secondly, conducting the study in an applied physical education setting demonstrated how repeated interruptions throughout the school year affected the physical activity levels of physical educations students. The frequent changes that occurred during a typical school year caused inconsistencies in student participation and fitness assessment scores. Interferences such as holding students for in-school-suspension (ISS) during physical education class, school seminars, TAKS testing, school functions and the use of a block schedule made it difficult to establish regularity with the students. Due to these inconsistencies we were only able to capture 10 workouts days for each condition during the two and a half month period.

Third, the use of multiple-testers affected the validity of the results amongst the four conditions. In the initial design each intern was assigned to administer one specific FITNESSGRAM test. However, during the testing school administers requested that the entire seventh grade class be included in the testing. This request modified the desired testing format designed for the study.

The inconsistent use of the heart rate monitors by students posed a problem. In spite of

previous instruction and constant reminders, some students did not start the heart rate monitor at the beginning of class, forgot to turn off the heart rate monitor at the end of class, stopped the monitor prior to the completion of the lesson or inadvertently engaged the stop button during an activity causing false times. These errors caused several students' data files to be discarded due to inaccurate data.

The problems of continuous heart rate monitoring over extended periods of time with children as subjects has been documented (Livingstone, 1994). Verschuur et al. (1985) reported a 50-55% success rate during daily heart rate monitoring with teenagers. This issue was handled by Strand and Reeder (1993a) by using wristbands as a barrier to cover the wrist units so that students wouldn't accidentally hit the Start/Stop button. The heart rate monitors were accurate in measuring intensity levels, however, care must be taken so that accurate data is compiled.

Replication of the current study with modifications to the physical assessment methodology would contribute to the physical education literature and provide a stronger evidence base for accepting the use of heart rate monitors in the physical education setting. This approach must be seen as an initial step for physical educators seeking to promote increases in MVPA in class and student attainment of the National Standards for Physical Education with the use of non-traditional conditions.

It becomes essential to investigate what occurs during physical education classes to determine what physical education teachers can do to increase students' activity levels. Physical activity is one component that is potentially modifiable. The challenge facing physical education teachers is to make effective use of a limited amount of class time to teach the knowledge and skills necessary to be successful in a wide variety of physical activities that promote health, fitness, skill building, enjoyment of sport and recreation, general well being, self-esteem, and

confidence (McGinnis, Kranner, & DeGraw, 1991). If integrated properly, heart rate monitors have the potential to enhance individual promotion of physical activity and also provide valuable outcome measures.

CONCLUSIONS

Whether the intent is to increase the amount of MVPA or increase fitness scores, heart rate monitors were shown to be an objective instrument and provided physical education teachers with a way to help students meet National and State fitness standards. Further research examining the relationship between heart rate monitors and physical activity conditions is warranted.

REFEREENCES

1. Aaron, D.J., Stori, K.L., Robertson, R.J., Kriska, A.M., & LaPorte, R.E. (2002). Longitudinal study of the number and choice of leisure time physical activities from mid to late adolescence: Implications for school curricula and community recreation programs. *Archives of Pediatrics and Adolescent Medicine, 156*: 1075-
2. Adams, C.E. (2005). First year research report of diabetes prevention demonstration in Mexican American middle school students. *University of Texas at El Paso, School of Nursing:* Technical Report #1.
3. Al-Nakeeb, Y., Duncan, M.J., Lyons, M., & Woodfeild, L. (1997). Body fatness and physical activity levels of young children. *Analysis of Human Biology, 34*(1): 1-12.
4. Armstrong, N. (1998). Young people's physical activity patterns as assessed by heart rate monitoring. *Journal of Sports Sciences, 16*: S9-S16.
5. Armstrong, N. & Welsman, J.R. (1997). Young People and Physical Activity. *Oxford: Oxford University Press.*
6. Armstrong, N., Welsman, J.R. &Kirby, B. (2000). Longitudinal changes in 11-13 year olds' physical activity. *Acta Paediatr, 89*: 775-780.
7. Baquet, G., Berthoin, S., & Praagh, E.V. (2002). Are intensified physical education sessions able to elicit heart rate at a sufficient level to promote aerobic fitness in adolescents. *Research Quarterly for Exercise and Sport, 73*(3): 282-289.
8. Claytor, R.P., Horn, T.S., & Iannotti, R.J. (2004). Heart rate monitoring as a measure of physical activity in children. *Medicine and Science in Sports and Exercise, 36* (11): 1964-1971.

9. Corbin, C.B., Pangrazi, R.P., & Le Masurier, G.C. (2004). Physical activity for children: Current patterns and guidelines. *Research Digest, 5*(2): 132-140.

10. Dwyer, J.J., Allison, K.R., Goldenberg, E.R., Fein, A.J., Yoshida, K.K., & Boutillier, M.A. (2000). Adolescent girls' perceived barriers to participation in physical activity. *Adolescence, 41*(161): 75-89.

11. Faigenbaum, A., Zaichkowsky, L., Westcott, W., Micheli, L., & Fehlandt, A. (1993). The effects of a twice-per-week strength-training program on children. *Pediatric Exercise Science, 5*: 339-346.

12. Fairbrother, A., Jones, M.A., & Hitchen, P.J. (2005). Reliability and concurrent validity of the multi-stage shuttle run test in adolescents athletes. *Journal of Sport Sciences, 23*(2): 196-200.

13. Falk, B.,& Tenebaum, G. (1996). The effectiveness of resistance training in children: A meta-analysis. *Sports Medicine, 22*: 176-186.

14. Freedson, P.S. & Miller, K. (2000). Objective monitoring of physical activity using motion sensors and heart rate. *Research Quarterly for Exercise and Sport, 71*(2): 21-28.

15. Frenn, M. & Malin, S. (2003). Diet an exercise in low-income culturally diverse middle school students. *Public Health Nursing, 20*(5): 361-368.

16. Frenn, M., Malin, S., Bansal, N., Delgado, M., Greer, Y., Havice, M., Ho, M. & Schweizer, H. (2003). Addressing health disparities in middle school students' nutrition and exercise. *Journal of Community Health Nursing, 20*(1): 1-14.

17. Grissom, T., Ward, P., Martin, B., & Leenders, N. (2005). Physical activity in physical education. *Family Community Health, 28*(2): 125-129.

18. Ham, S.A., Reis, J.P., Strath, S.J., Dubose, K.D., & Ainsworth, B.E. (2007). Discrepancies between methods of identifying objectively determined physical activity. *Medicine and Science in Sports and Exercise, 39*(1): 52-58.

19. Healthy People 2000: (1991). National Health Promotion and Disease Prevention Objectives. *Washington, DC: Public Health Service: DHHS Publication PHS 91-50212.*

20. Hussey, J., Bell., & Gormley, J. (2007). The measurement of physical activity in children. *Physical Therapy Reviews, 12*: 52-58.

21. Janz, K.F., Golden, J.C., Hansen, J.R., & Mahoeny, L.T. (1992). Heart rate monitoring of physical activity in children and adolescents: the Muscatine study. *Pediatrics, 89*(2): 256-2161.

22. Klijn, P.C., Bann-Slootweg, O.H., & Van Stel, H.F. (2007). Aerobic exercise in adolescents with obesity: preliminary evaluation of a modular training program and the modified shuttle test. *BMC Pediatrics, 7*(19): 19-24.

23. Kohl, H. W., Fulton, J.E. & Caspersen, C.J. (2003). Assessment of physical activity among children and adolescents: a review and a synthesis. *Preventative Medicine, 31*: 54-76

24. Leger, L. & Thivierge, M. (1988). Heart rate monitors. Validity, stability, and functionality. *The Physician and Sports-medicine, 16*: 143-151.

25. Livingstone, M. B.E. (1994). Energy expenditure and physical activity in relation to fitness in childen. *Proceedings of the Nutrition Society, 53*: 207-211.

26. Mannie, K. (2004). Overload without overtraining. *Coach and Athletic Director, 74*(4): 9-12.

27. Martin, B., Grissom, T., Ward, P., & Lenders, Y.J. (2003). Effects of wearing heart rate

monitors on elementary students' activity levels during a team handball unit. *Research Quarterly for Exercise and Sport, 74*(1): 49-52.

28. Masurier, G.E. & Corbin, C.B. (2006). Top 10 reasons for quality physical education. *The Journal of Physical Education, Recreation, & Dance, 77*(6): 44-54.
29. McGinnis, J. M., Kanner, L., & DeGraw, C. (1991). Physical education's role in achieving national health objectives. *Research Quarterly for Exercise and Sport, 62*: 138-142.
30. Mier, N., Ory, M.G., Zhan, D., Wang, S., & Burdine, J.N. (2007). Levels and correlates of exercise in a border Mexican American population. *American Journal of Health Behavior, 31*(2): 159-169.
31. Mitchell, B.M., Strasburger, J.F., & Donkin-Kursar, S. (2001). Heart rates during an intensity-controlled one-mile run in 11-to-14 year old children. *Measurement in Physical Education & Exercise, 5*(2): 109-115.
32. Mohr, D.J., Townsend, S., & Pritchard, T. (2006). Rethinking middle school physical education: Combining lifetime leisure activities and sport education to encourage physical activity. *Physical Educator, 63*(1): 18-30.
33. Molnár, D. & Livingstone, B. (2000). Physical activity in relation to overweight and obesity in children and adolescents. *European Journal of Pediatrics, 159*: S45-S55.
34. Morrow, J.R. & Freedson, (1994). Relationship between habitual physical activity and aerobic fitness in adolescents. *Pediatric Exercise Science, 6:* 315-329.
35. Ogden, C.L., Carroll, M.D., & Curtin, L.R. (2006). Prevalence of overweight and obesity in the United States, 1999-2004. *Journal of American Medical Association, 295*: 1549-1555.
36. Pate, R.R., Davis, M.G., Robinson, T.N., Stone, E.J., McKenzie, T.L., & Young,

J.C. (2006). Promoting physical activity in children and youth: A leadership role for schools. *American Heart Association Inc, 14*: 1214-1224.

37. Puhl, J., Greaves, K.A. & Hoyt, M. (1990). Children's activity rating scale (CARS): description and evaluation. *Research Quarterly in Exercise and Sport, 61*(1): 26-36.

38. Quinn, P. & Strand, B. (1995). A comparison of two instructional formats on heart rate intensity and skill development. *The Physical Educator, 52*(2): 62-69.

39. Ryan, S., Fleming, D. & Maina, M. (2003). Attitudes of middle school students toward their physical education teachers and classes. *Physical Educator, 60*(2): 28-37.

40. Sallis, J.F., & McKenzie, T.L. (1991). Physical education's role in public health. *Research Quarterly for Exercise and Sport, 62:* 124-137.

41. Schnirring, L. (2005). Fitness-focused physical education reaps benefits. *Physician & Sportsmedicine, 33*(11): 4-8.

42. Shane, P. (2006). Physical education in the middle school. *Primary & Middle Years Educator, 4*(2): 129-134.

43. Simons-Morton, B.G., Taylor, W.C., Snider, S.A., & Huang, M.S. (1993). The physical activity of fifth grade students during physical education classes. *American Journal of Public Health, 83*(2): 262-264.

44. State Legislature of the State of Texas, Section 28.002. (2001). *Education Code Bill Number TX 77RSB19.*

45. Strand, B. & Reeder, S. (1993a). Using heart rate monitors in research on fitness levels of children in physical education. *Journal of Teaching in Physical Education, 12*: 215-220.

46. Strand. B & Reeder, S. (1993b). A comparison of time in the training zone from two independent studies involving middle school. *Physical Educator, 50*(4): 122-126.

47. Treiber, F.A., Musante, L., Hartdagan, S., Davis, H., Levy, M., & Strong, W.B. (1989). Validation of a heart rate monitor with children in laboratory and field settings. *Medicine and Science in Sports and Exercise, 21*: 338-342.

48. Trost, S.G., Saunders, R. & Ward, D.S. (2002). Determinants of physical activity in middle school children. *American Journal of Health Behavior, 26*(2): 95-102.

49. U.S. Department of Health and Human Services. (2008). 2008 Physical activity guidelines for Americans. Washington, D.C: U.S. Department of Health and Human Services.

50. Verschuur, R. & Kemper, H.C.G. (1985). Habitual physical activity. *Medicine and Sport Science, 20*: 56-65.

51. Welk, G.J. (2008).The role of physical activity assessments for school-based physical activity promotion. *Measurements in Physical Education and Exercise Science,* 12: 184-206.

52. Welk, G.J. & Corbin, C.B. (1995). The validity of the tritrac-r3d activity monitor for the assessment of physical activity in children. *Research Quarterly in Exercise and Sport, 66*(3): 202-208.

53. Welk, G.J., Corbin, C.B., & Dale, D. (2000). Measurement issues in the assessment of physical activity in children. *Research Quarterly for Exercise and Sport, 71*(2): 59-77.

Table 1.

Participants' Demographic Statistics

	Mean	Standard Deviation	Range
Age (yr)	13.2	0.70	12 – 15
Stature (cm)	157.96	0.96	139.73 – 182.88
Body Weight (kg)	58.90	35.32	29.48 – 93.89
BMI	22.79	4.77	15.1 – 33.1

Table 2.

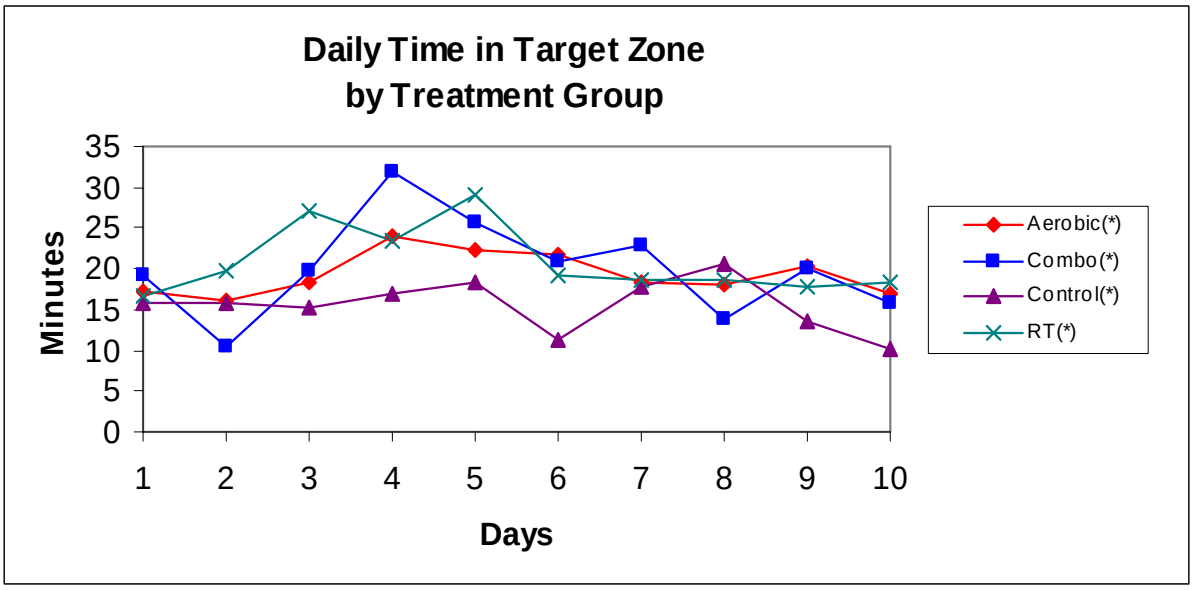
Percent of Time In Target Heart Rate Zone (HRZ) for Each Intervention Over 10 days)

Intervention	Percentage of Total Time	Total Time in HRZ	Daily Mean Time in HRZ
Aerobic Activities	58%	193min	19min
Aerobic Resistance	52%	200min	20min
Resistance Training	49%	209min	20min
Current Curriculum	42%	155min	15min

Table 3.

Effects of Polar's Borderland Heartbeats for Healthy Living Interventions on Health-Related Fitness Measures: Results of ANOVA

Fitness Variable (FITNESSGRAM)	Intervention	Pretest Mean	Posttest Mean	ANOVA *P*
Weight (kg)	Aerobic Activities	53.26	51.41	$p = 0.0015$
	Aerobic Resistance	53.03	54.75	$p = 0.0345$
	Current Curriculum	60.46	60.22	$p = 0.8468$
	Resistance Training	61.22	62.35	$p = 0.1759$
BMI	Aerobic Activities	21.85	20.98	$p = 0.0003$
	Aerobic Resistance	21.60	22.4	$p = 0.0121$
	Current Curriculum	23.64	23.57	$p = 0.8680$
	Resistance Training	23.81	24.20	$p = 0.2197$
PACER (sec)	Aerobic Activities	28.55	35.85	$p = 0.2441$
	Aerobic Resistance	23	29.5	$p = 0.1030$
	Current Curriculum	29.42	29.5	$p = 0.8693$
	Resistance Training	24.33	16.26	$p = 0.0176$
Curl-up (repetitions)	Aerobic Activities	28.9	44.25	$p = 0.0973$
	Aerobic Resistance	19.07	33.42	$p = 0.0026$
	Current Curriculum	49.64	44.57	$p = 0.9376$
	Resistance Training	24.06	35.86	$p = 0.0041$
Push-up (repetitions)	Aerobic Activities	13.2	14.8	$p = 0.9553$
	Aerobic Resistance	7.78	12.21	$p = 0.0051$
	Current Curriculum	13.57	14.64	$p = 0.8471$
	Resistance Training	5.6	11.6	$p = 0.0002$



Graph 1. Daily Mean Time In Target Heart Rate Zone across the 10 days

APPENDIX A: UTEP AND EPISD LETTER OF APPROVALS

THE UNIVERSITY OF TEXAS AT EL PASO
Office of the Vice President for Research and Sponsored Projects
Institutional Review Board
El Paso, Texas 79968-0587
phone: 915 747-8841 fax: 915 747-5931

DATE: December 11, 2007

TO: Chris Estrada
FROM: University of Texas at El Paso IRB

STUDY TITLE: [78159-2] - Effects of Selected Physical Activities on Maintenance Of Target Heart Rate in Hispanic Middle School Students
IRB REFERENCE #:
SUBMISSION TYPE: New Study

ACTION: APPROVED
APPROVAL DATE: December 11, 2007
EXPIRATION DATE: October 17, 2008
REVIEW TYPE: Expedited Review

Thank you for your submission of the EPISD Approval letter for this research study. University of Texas at El Paso IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This study has received Exempt (Administrative) Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the study and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the study via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the signed consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All SERIOUS and UNEXPECTED adverse events must be reported to this office. Please use the appropriate adverse event forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office.

Please note that all research records must be retained for a minimum of three years after termination of the project.

Based on the risks, this project requires Continuing Review by this office on an annual basis. Please use the appropriate renewal forms for this procedure.

If you have any questions, please contact Lola Norton at 915-747-8841 or irb.orsp@utep.edu. Please include your study title and reference number in all correspondence with this office.

El Paso
Independent
School District
Research and Evaluation

December 6, 2007

Chris Estrada
12636 San Haven
El Paso, Texas 79938

Dear Ms. Estrada,

Your study, *Effects of Selected Physical Activities on Maintenance of Target Heart Rate in Hispanic Middle School Students*, has been approved. You will conduct the research at Guillen Middle School, under the endorsement of Principal James Lawler.

You have our best wishes for a successful study. Please contact me at (915) 779-4055 or email me at cperales@episd.org if you need additional assistance. Thank you.

Sincerely

Carlos Perales
Evaluator

cc: James Lawler, Principal

Approved: _____
Art Jordan, Executive Director

Education Center-Boeing
6531 Boeing Drive • El Paso, Texas 79925 • (915)779-4260 • FAX (915) 771-1145
Mailing Address: P.O. Box 20100 • El Paso, Texas 79998-0100

APPENDIX B: EXTENDED LITERATURE REVIEW

As a component of the public school curriculum, physical education has received increasing attention recently relative to addressing the inactivity of adolescents and their activity patterns as they grow into adulthood (Grissom, Ward, Martin, & Nicole, 2005). Most adolescents are required to enroll in physical education classes during their public school careers. However, the amount of physical activity middle school students receive during physical education classes falls short of the national recommendation of approximately 60 minutes per day of organized extracurricular physical activity at school (National Association for Sport and Physical Education, 2005). It has been stated that physical education is the only curricular area that can address the health related physical activity needs of virtually all children (Sallis, McKenzie, & Alcaraz, 1993). One in five adolescents (21%) in the United States is overweight (National Center for Health Statistics, 1999). This trend is relevant in Texas since childhood overweightness is higher than the national average (Hoelscher, Day, Lee, Frankowski, Kelder, Ward, & Scheurer, 2004). Ogden, Carroll, and Curtin (2006) stated that the prevalence of childhood obesity was greater in Texas in 2004-2005 than the U.S. rates reported for the 2003-2004 National Health and Nutrition Examination Survey (NHANES). Overweightness in Texas has been found to be higher that the National average (Hoelscher, Day, Lee, Frankowski, Kelder, Ward, & Scheurer, 2004). In 2004-2005, the prevalence of childhood obesity was greater in Texas (32.4%) than the United States rates (30.6%) reported in the 2003-2004 National Health and Nutrition Examination (NHANES) (Ogden, Carroll, and Curtin, 2006). Studies of adolescents' physical activity levels were not extensive but the predominant view was most adolescents are not sufficiently active to attain optimum health levels (Frenn, Malin, Bensal, Delgado, Greer, et al., 2003). The overall prevalence of overweight and obesity in Texas

schoolchildren was 39% for eighth-graders in 2004-2005 (Hoelscher, Perez, Lee, Sanders, Kelder, et al., 2005). This is far below the national objective that children should be active at least 50% of physical education class time (Healthy People 2000, 1991).

Aaron, Stori, Robertson, Kriska, and LaPorte (2002) stated that activity declines 26-37% during adolescence, with 85% of middle school students reporting a decrease in activity by the time they are in high school. As a result of lack of physical activity, more and more adolescents are obese and overweight. Despite the public school physical education requirement, there was evidence that sizeable percentages of youth fail to meet established guidelines for participation in physical activity (Trost, Saunders, & Ward, 2002).

As with adults, the prevalence of overweightness among adolescents in the United States continues to increase (Schmitz, Hamack, David, Gao, & Lytle, 2004). Kann, Grumbaum, McKenna, Wechsler, and Galuska (2004) stated up to 70% of overweight adolescents become overweight adults. It has been estimated that among US children aged 6 to 19 years, one-third are overweight or at risk for overweight, which was more than a twofold increase over the past two decades (Harrell, Davy, Stewart, & King, 2005). Corbin, Pangrazi, and LeMasurier (2004) found that as many as 20-50% of adolescents get insufficient activity and 6-12% get no moderate or vigorous physical activity on a daily basis. Frenn, Malin, Bansal, Delgado, Greer, et al. (2003) found that nearly half of American youths aged 12-21 lacked vigorous activity on a regular basis.

Over the past three decades, the prevalence of obesity has more than tripled for youth aged 6-11 years and more than doubled for youth aged 12-19 years. (Committee on Prevention of Obesity in Children and Youth, 2005). The inactivity in adolescents was more common among girls (14%) than boys (7%) (National Center for Chronic Disease Prevention and Health

Promotion, 2001). Shane (2006) concluded that participation in physical activity tended to peak between ages 10 through 13. Studies consistently reported a decline in physical activity with age, at least during the teen years (Simon, Wagner, DiVita, Rauscher, & Klein-Platat, 2004; Grissom, Ward, Martin, & Leenders, 2005).

Ogden, Flegal, and Carroll (2002) examined the prevalence of overweightness in US children using the most recent national data with measured weights and heights and to examine trends in overweight prevalence. The NHANES results showed that the prevalence of overweightness and obesity in children, adolescents, and young adults ages 2 to 19 years old has increased dramatically since the 1960's. The prevalence of overweightness in these age-groups ranged from 20.6% among children 2 to 5 years old to 30.4% among adolescents 12 to 19 years old. Between the 1960's and 1988-1994, the prevalence among 6-through 11-year old children increased from 4% to 11%. During this same period, the prevalence among 12-through 19-year olds increased from 5% to 11%.

Ogden, Carroll, and Flegal (2008) conducted a follow up study to estimate the prevalence of 3 measures of high body mass index for age and to examine recent trends for US children and adolescents using national data with measured heights and weights. Height and weight measurements were obtained from 8165 children and adolescents as part of the 2003-2004 and 2005-2006 NHANES. Results showed that in 2003-2006, 11.3% of children and adolescents aged 2 through 19 years were at or above the 97th percentile of the 2000 BMI-for-age growth charts, 16.3% were at or above the 95th percentile, and 31.9% were at or above the 85th percentile.

Mier, Ory, Zhan, Wang, and Burdine (2007) examined personal and environmental correlates of exercise among Mexican Americans living in the Texas-Mexico border region. The

study was based on data from the South Texas Health Status Assessment from a community health survey conducted in 2002. A random-digit-dialed community survey was used to contact 923 participants who were 18 years or older in 2 countries in the Lower Rio Grande Valley. Results indicated more than half of participants (52%) did not exercise at all during the week and only 20% reported 30 minutes of exercise 3 or more times per week. Mier et al. (2007) also concluded that in Texas, more Hispanics (34.5%) than Whites (10.4%) or Blacks (24.8%) are physically inactive. Importantly, 40.5% of Hispanics living in the easternmost part of the Texas-Mexico border where almost half of the Texas-Mexico border population resides reported no leisure-time physical activity compared to 24% of whites (Texas Department of State Health Services, 2005). It has become apparent that monitoring physical activity in adolescents for public health purposes has become a key component of disease prevention. Studies on adolescents physical activity levels were not extensive, but the predominate view has been that most adolescents are not sufficiently active to attain optimum health.

Adolescence

Adolescence is a period of rapid change and physical growth accompanied by profound emotional and psychological changes (Fairbrother, Jones, & Hitchen, 2005). Shane (2006) stated that adolescence is a time for developing the habits required for physical activity and healthy living now and in the future. This period affects individuals far beyond the middle school years into adulthood. Middle school students are at an age and in a setting that offer great potential for effective and efficient interventions (Frenn & Malin, 2003). Frenn, Malin, Bansal, Delgado, Greer, Havice, Ho, and Schweizer (2003) stated that the middle school years are important to improve student health behaviors.

For some adolescents, physical education class provided the only opportunity to exercise

and to acquire the benefits of physical activity (Michell, Strasburger, & Donkin-Kursar, 2001). With physical educators in contact with students at least 9 of the 12 years of schooling, there exists an unprecedented opportunity to influence and monitor the activity patterns of adolescents focused on the promotion of daily physical activity. An important responsibility of physical education teachers is teaching adolescents how and why they should be physically active throughout life (Chase, Vealy, Galli, Evers, Klug, et al., 2007).

Socialcultural and Socioeconomic Influence

Understanding personal and environmental factors influencing physical activity and exercise in the Hispanic population is essential for the development of culturally sensitive health interventions. It is important to understand constructs essential to physical activity behaviors of low-income culturally diverse middle-school-age students since these groups are most at risk for obesity later in life (Frenn & Malin, 2003).

Research findings have shown that socialcultural and socioeconomic status have a strong influence on body weight status and participation in physical activity (Allen, Elliott, Morales, Diamant, Hambarsoomian, & Schuster, 2007; Goodman, Slap, & Huang, 2003). For the past 3 decades, the relationship between socioeconomic status and health has been the subject of intense research (Adler, Boyce, & Chesney, 1994). The literature on social inequalities has contained little discussion of adolescence, the time of transition from childhood to adulthood (Adler et al., 1994).

Park, Menard, and Schoolfield (2001) investigated the prevalence of overweightness among different ethnic and gender groups of children and adolescents in the San Antonio, TX area and compared the prevalence with that of the US National figures. A total of 7208 schoolchildren (Mexican American-58.5%, non-Hispanic white-28.3%, and African American-

13.2%) ranging in age from 5 to 17 years in 3 selected school districts participated. Skinfold measurements, BMI, height, and height were measured. The data were compared with the age- and gender-specific 85^{th} and 95^{th} percentile cut-off points on the NHANES I population data.

Results revealed BMI values of Mexican American boys were almost consistently and significantly ($P < 0.05$) larger than non-Hispanic White boys and showed a tendency to be larger than African American boys beginning as early as age 6 and continuing through age 17. Compared to the NHANES I data, the prevalence of overwrightness (BMI $\geq 95^{th}$ percentile) was greater in Mexican Americans (15-28%) and African American (11-29%) boys and girls than in non-Hispanic White (7-17%) counterparts. When compared to the National survey data the prevalence of overweightness found in this study was higher.

The health benefits of physical activity for adults have been well established but this is not the case for adolescents since it takes time for unhealthy behaviors to influence chronic diseases. Obese children and adolescents were at increased risk for adult obesity and were more likely than their lean counterparts to experience significant short-term health problems such as hyperlipidemia, hypertension, glucose intolerance and orthopedic complications (Must & Strauss, 1999). Weight-related comorbilities, such as type 2 diabetes, once found only among adults were being diagnosed in teens and young adults (Schnirring, 2005). More specifically, Mexican Americans living at the United States-Mexico border region suffered nearly 50% higher prevalence of diabetes when compared to National rates (Mier et al., 2007).

Current research reported that obese children were at a higher risk for obesity as adults (Zapata, Bryant, McDermott, & Hefelfinger, 2008). Jain (2004) estimated between 40% and 70% of obese children will become obese adults. The probability of childhood obesity persisting into adulthood was estimated to increase from approximately 20% at 4 years of age to

approximately 80% by adolescence (Guo & Chomlea, 1999). Hoelscher, Feldman, Johnson, Lytle, Osganian, Parcel, Kelder, Stone, and Nader, (2004) stated that increased prevalence of overweightness in children will undoubtedly lead to an exacerbation of obesity-related chronic disease among adults.

Adolescent Hispanics not only bear excess health risks related to physical inactivity, but were also affected by higher morbidity and mortality rates from diabetes and cardiovascular disease than those of Whites (Pate, Pratt, & Blair, 1995). Eakin, Villarruel, Jemmott, Ronis, and Bigelow (2005) concluded that obesity had risen in all segments of the population but is more prevalent among Latino youth than non-Hispanic Whites.

Consistent with theories that emphasize environmental influences was the fact that pediatric obesity in Mexico was lower than that seen in U.S. among Mexican Americans (Stovitz, Schwimmer, Martinez, & Story, 2008). Using the Centers for Disease Control and Prevention (CDC) 2000 BMI reference standards for adolescent boys, the Mexican National Health Survey found that 10% of Mexican adolescent boys had a BMI greater than the 95th percentile (Del Rio-Navarro, Velasquez,-Monroy, & Sanchez-Castillo, 2004). During the similar time period, 27% of Mexican-American boys in the 1999-2000 NHANES survey had a BMI greater than the 95th percentile. Additionally, within Mexico, overweight rates were highest in regions closest to the U.S. (Stovitz et al., 2008).

Physical Activity

Melville and Hammermeister (2006) defined regular physical activity as: (a) an accumulation of at least 30 minutes of moderate "lifestyle physical activities" on all or most days of the week (b) moderate to vigorous aerobic activities 3-6 times per week (c) muscle fitness exercise 2-3 times per week and (d) flexibility or range of motion exercises 3-7 times per week.

The Surgeon General recommended 30 minutes of moderate physical activity daily; vigorous activity at least 3 days a week and bouts of fitness exercises several days a week for teens (Masurier & Corbin, 2006). The revised National Association for Sport and Physical Education (NASPE) guidelines for youth 5-12 years recommended that children accumulate 60 or more minutes of developmentally appropriate physical activity on all or most days of the week but 15 minutes or more of continuous physical activity each day (National Association for Sports and Physical Education, 2005). Healthy People 2010 emphasized the importance of both physical activity and physical education for children and adolescents by recommending 30 minutes per day, 5 days per week of moderate physical activity, 20 minutes per day, 3 days per week of vigorous activity, and daily school participation in physical education (Barroso, McCullum-Gomez, Hoelscher, Kelder, & Murray, 2005).

In Texas, Senate Bill 19 passed in June 2001 mandated that every school district in the state establish an implement a K-5 coordinated school health program. Senate Bill 19 also required elementary school students to participate in 30 minutes of daily physical activity or 135 minutes per week. Each school district had provide training and engage in these activities no later than September 1, 2007 (State Legislature of the State of Texas, 2001). In May 2007, Senate Bill 530 was passed which required K-5th grade student to be fitness tested each year. The new law required 30 minutes of moderate-to-vigorous activity during K-5th grade physical education classes or recess. In 2008, 6th-8th grades were added to be fitness tested and participate in moderate-to-vigorous activity 4 out of the 6 semesters either 30 minutes daily, 125 minutes during a school week, or 222 minutes over two weeks. Recently, in September 2007, the FITNESSGRAM was approved as the official testing vehicle by the Texas Education Agency (TEA).

Health Benefits of Physical Activity

Although more research is needed on the association between physical activity and health among young people (Alpert & Wilmore, 1994), evidence shows that physical activity resulted in some health benefits for children and adolescents. For example, regular physical activity improved aerobic endurance (Aaron, Kriska, & Dearwater, 1993) and muscular strength (Sallis, McKenzie, & Alcaraz, 1993). Physical activity and physical fitness may favorably affect risk factors for cardiovascular disease (e.g., body mass index, blood lipid profiles, and resting blood pressure) (Blessing, Keith, Williford, Blessing, & Barksdale, 1995). Regular physical activity among children and adolescents with chronic disease risk factors was important (Epstein, Coleman, & Myers, 1996). It decreased blood pressure in adolescents with borderline hypertension (Alpert et al., 1994), increased physical fitness in obese children (Ignico & Mahon, 1995), decreased the degree of overweightness among obese children (Epstein, Valoski, & Vara, 1995), and decreased body fat (Faigenbaum, Zaichkowsky, Westcott, Micheli, & Fehlandt, 1993).

Regular physical activity during adolescence was associated with numerous physiological and psychosocial benefits and has the potential to improve the quality of life for boys and girls (Faigenbaum & Mediate, 2006). Crews and Lochbaum (2004) investigated the effects of a structured physical fitness program on psychological well-being in low-income Hispanic children. A total of 66 students in the fourth grade were randomly assigned to either an aerobic intensity or a control intensity physical activity program. Results showed that children in the aerobic intensity program had significantly ($p < 0.5$) less depression. The main effect for self-esteem reflected the aerobic group's greater self-reported self esteem. Calfas and Taylor (1994) stated that physical activity among adolescents is consistently related to higher levels of self-

esteem and self concept and lower levels of anxiety and stress.

Moderate to Vigorous Physical Activity

Regular participation in moderate-to-vigorous intensity physical activity was widely acknowledged as a key component of a healthy lifestyle for adults and youth (Dowda, Pate, Felton, Saunders, Ward, et al., 2004). However, youth and adolescents generally did not engage in "intense" or "moderate to vigorous physical activity" for extended periods (i.e., > 20 min per time) (Morrow & Freedson, 1994). Sustained high intensity activity was unlikely to be a part of their typical daily routines unless they were training for a specific purpose (i.e., sports team) (Morrow et al., 1994). Simons-Morton, Taylor, and Snider (1997) stated that physical education specialists provided students with only 3 minutes of moderate to vigorous physical activity per physical education class; that was less than 10% of class time.

Simons-Morton, McKenzie, and Stone (1997) assessed the amount and distribution of daily physical activity levels through systematic interviews in a multiethnic sample of 2,410 third-grade students in 96 schools located in 4 states. Results indicated that students reported a daily average of 89.9 minutes of moderate to vigorous activity, 34.7 minutes of vigorous activity, and 120.4 minutes of sedentary behavior. However, 36% obtained less than 60 minutes of daily moderate to vigorous physical activity, while approximately 13% reported less than 30 minutes of daily moderate to vigorous activity.

Simons-Morton, Taylor, Snider, and Huang (1993) evaluated the physical activity levels of 157 fifth-grade students in 20 of the 355 elementary schools in one Texas County. A trained interviewer/observer monitored the student's: 1) activity intensity; 2) type of activity; 3) whether the student was "on task" or "off task" and; 4) instructional mode. The activity intensity categories had been validated previously against measured heart rates. The type of activity was

categorized as sedentary, minimal activity, or moderate-to-vigorous activity. The observed student was considered on task when involved in the main activity and off task when engaged in another task. Instructional modes included class management, instruction, skills practice, and supervised play.

On average, the students spent 8.5% of class time in moderate to vigorous physical activity, 23.3% in minimal activity, and 68.1% in sedentary activity. None of students in the 22 schools evaluated in the study averaged 20% of class time in moderate to vigorous physical activity. The levels of physical activity observed were substantially lower than the levels called for in the national health objectives of at least 30 minutes of moderate-to-vigorous activity at least 3 times per week.

Barroso et al. (2005) stated that one explanation for low levels of physical activity among adolescents was district-and-state-mandated requirements for physical education and support to implement physical education programs varied greatly. This suggested physical education requirements should be standardized and physical education curricula improved to increase moderate-to-vigorous physical activity. Grissom, Ward, Martin, and Leenders (2005) concluded that many physical education lessons were not constructed in ways where students were physically active at least 50% of the lesson time stating it may be the trade-off between focusing on skill proficiency and keeping students engaged in moderate to vigorous physical activity. Collectively, these findings emphasize that providing daily physical activity education to children and adolescents will not appreciably increase the amount of activity children and adolescents engage in unless a larger proportion of each physical education class was devoted to moderate to vigorous activity.

Health Oriented Activities

Recently there has been a movement towards physical education curricula that encompassed "health-related fitness" approaches such as weight training and aerobic exercise. These health-related activities have shown great improvements in physical fitness for all age levels. Accordingly, the establishment and maintenance of physical fitness was a widely stated objective in physical education programs (Lacy & LaMaster, 1990).

Schnirring (2005) investigated a random, controlled study, at the University of Wisconsin at Madison. Two physical activity protocols were implemented in a rural middle school with 50 children who were overweight (body mass index above 95th percentile for age). Baseline measurements were taken for body fat and fat-free body mass, maximal oxygen consumption, insulin and glucose. After baseline testing students were randomly enrolled for a 9 month school year into 1 of 2 physical education protocols: standard physical education class or a lifestyle focused fitness-oriented class. Both classes met 5 times every 2 weeks for 45 minutes. The lifestyle focused class participated in non competitive activities such as walking, cycling, and snowshoeing. The intervention group also received a small nutritional component that consisted of handouts on the food pyramid, portion sizes, and the benefits of healthy food choices.

After 9 months, the intervention group showed greater improvements compared with the control group in body fat, cardiovascular fitness, and greater improvements in fasting insulin levels. Researchers concluded that simple modifications in the physical education curriculum can produce measurable health benefits. Results also revealed that aerobic exercise may be a useful treatment strategy for insulin resistance in children.

For many years, it was believed that strength training was ineffective or unsafe for children due to their physical immaturity (Faigenbaum, 2001). The prevailing attitude among physical educators and healthcare providers was that strength-training-induced gains before

puberty were not possible due to inadequate levels of circulating androgens and such training would be potentially injurious to the physical growth of children. Research over the past 10 to 15 years has provided convincing evidence that strength training can be a safe and effective method of conditioning for children as long as appropriate guidelines were followed (Falk & Tenebaum, 1996). Faigenbaum, Milliken, LaRosa, Burak, Doherty, et al. (2002) compared the effects of 1 and 2 days per week (8 weeks total) of strength training on upper and lower body strength, and motor performance ability in 55 children (21 girls and 34 boys). Participants strength trained either once per week (n = 22) or twice per week (n = 20) for 8 weeks. Each training session consisted of a single set of 10-15 repetitions on 12 exercises using child-sized machines. Thirteen children who did not strength train served as age-matured controls. One-repetition (1RM) strength on the chest press and leg press, hand grip strength, long jump, vertical jump, and flexibility were assessed at baseline and post training.

Results indicated that participants who trained twice per week made significantly greater gains in 1RM chest press strength compared to the control group (11.5 and 4.4% respectively, $p < .05$). Participants who trained once and twice per week gained 1RM leg press strength (14.2% for 1 day and 24.7% for 2 days per week, respectively) that was significantly greater than control group gains (2.4%). In addition, to favorable changes in body composition, regular participation in strength-building activities gave obese youth a chance to experience success, feel good about their performances, and gain confidence in their abilities to be physically active.

Aerobic exercise has been shown to decrease body fat, attenuate the loss of lean body mass normally seen during dietary energy restriction and decrease the accumulation of visceral adipose tissue (Owens, Gutin, Allison, Riggs, Ferguson, et al., 1999). Klijin, Bann-Slootweg, and Van Stel (2007) developed an aerobic training program for adolescents with severe obesity

(body mass index above 95th percentile). Subjects trained 3 days per week for 12 weeks, with each session lasting 30-60 minutes. The modular training program consisted of indoor, outdoor, and swimming activities. Results showed that a modular, varied aerobic training program had clinically relevant effects on aerobic performance in adolescents with severe obesity.

Regular participation in a cardiovascular and strength training program has the potential to positively influence several measurable indices of health such as bone-mineral density (Morris, Naughton, Gibbs, Carlson, & Wark, 1997), body composition (Faigenbaum et al., 1993), cardiorespiratory fitness (Weltman, Janney, Strand, Berg, Tippit et al., 1986), flexibility, muscular endurance and strength. Baranowski and Bouchard (1992) also concluded that measurable benefits of regular childhood physical activity have shown improved strength, weight control, body composition, and cardiorespiratory fitness.

Physical Education

Physical education becomes an elective study option for many students after the sixth grade (Shane, 2006). The typical physical education program in middle school was dominated by traditional sport and competition oriented activities such as football, soccer, volleyball, and basketball. These competition-focused sport activities typically identified participants as "winner and losers" (Ryan, Fleming, & Maina, 2003). A concern with this emphasis in the middle school curriculum is that relatively few adolescents continued to engage in competitive sports during adulthood (Mohr, Townsend, & Pritchard, 2006). As students moved through the school system, it was increasingly evident that those who were the most skilled received the most attention when competitive sport activities dominated (Luepker, Perry, McKinlay, Naden, Parcel, et al., 1996).

Participation in physical education declined with age as students moved through the

education system (Luepker et al., 1996). There have been many factors within the schools that encouraged this trend. Tightening budgets, reduced facilities and lost resources have combined with an emphasis on academic subjects reduced the amount of time devoted to physical education. Baquet, Berthoin, and Praagh (2002) concluded that exercise intensity during physical education is rarely individualized to the capacity of each adolescent and the lesson goal was generally to improve motor skills.

According to (Pate, Davis, Robinson, Stone, McKenzie, et al., 2006) physical education has traditionally pursued objectives that were not necessarily directly related to important health outcomes such as cardiovascular fitness, body composition, muscular endurance, and flexibility. Therefore, there is a need for a new approach to teaching physical education to motivate middle school students to participate in physical activity. Establishing patterns of physical activity during childhood and adolescence was important for immediate gains in health and well-being and to develop positive behaviors that can be deployed throughout the life course (Dwyer, Allison, Goldenberg, Fein, Yoshida, et al., 2000).

School Based Programs

School-based programs offer an efficient means of promoting the health of large numbers of children and adolescents. According to (Hoelscher, Feldman, Johnson, Lytle, Osganian, et al., 2004) school-based health promotion has given considerable attention to developing and evaluating multi-component programs that targeted the school environment and curriculum to impact students' opportunities for healthful food and physical activity choices. To date, the most common program components that have been evaluated include: changes in school curriculum, altering the foods available in schools, or modifying physical education classes (Hoelscher, Feldman, Johson, Lytle, Osganian, Parcel, Kelder, Stone, & Nader, 2004).

One of the more popular school-based programs was the Coordinated Approach to Child Health (CATCH) program which was designed to decrease risk factors for chronic disease in elementary school children and included separate coordinated interventions for child nutrition services, physical education, classroom instruction, and family education. The CATCH program was a coordinated school health program that has been approved by the TEA and has met the requirements of Texas Senate Bill 19 (Barroso et al., 2005).

Barroso et al. (2005) surveyed physical education specialists who attended CATCH training during the 2000-2003 school years. Participants were surveyed using a questionnaire about CATCH physical education at their respective schools. The questionnaire included items pertaining to physical education barriers, implementation and satisfaction of CATCH physical education, and demographic characteristics. In Texas, CATCH has evolved from a formal research project into an academic-government-community partnership. Results from the survey indicated that significant barriers exist in providing quality physical education, an important element of coordinated school health in Texas. Physical education specialists trained in the CATCH program reported large class size, low priority relative to other academic subjects, inadequate financial resources, and inadequate facilities to be major obstacles.

Luepker et al. (1996) concluded that population–based programs focused on school-based interventions in older children have produced only minimal changes in weight or BMI. In a recently completed multi-center study involving approximately 5000 students aged 8-9 years and their parents, the CATCH program failed to demonstrate significant differences in students' weight, skinfold thickness, BMI, cholesterol or blood pressure, between the intervention and control schools at the 3 year follow ups.

Bonhauser, Fernandez, Püschel, Yanez, Montero, et al. (2005) evaluated the effects of a

school-based physical activity program on physical fitness and mental health status on adolescents (198 students aged 15 years old) living in a low socioeconomic status area in Santiago, Chile. A quasi-experimental design was used to evaluate the effects of the program over one academic year. Findings revealed that a school-based program to improve physical activity in adolescents of low socioeconomic status obtained a high level of participation and achieved significant benefits in terms of physical fitness and mental health status.

Sallis, McKenzie, Alcaraz, Kolody, Faucette, and Hovell (1997) evaluated a health-related physical education program (SPARK) on fourth and fifth grade students (955 students) designed to increase physical activity during physical education classes and outside of school during a 2 year period. Seven elementary schools were assigned to 1 of 3 conditions (specialist-led condition, teacher-led condition, and control or usual physical education). Specialist-led condition was led by a certified physical education specialist, teacher-led condition was led by classroom teachers and the control group was lead by untrained classroom teachers. Classes were conducted 3 days per week lasting 30 minutes. SPARK lessons plans had two parts: health-fitness activities (15 minutes) and skill-fitness activities (15 minutes).

Results revealed that health-related physical education programs provided children with substantially more physical activity than the control condition. Students spent more minutes per week being physically active in specialist-led (40 min) and teacher-led (33 min) physical education classes than in control classes (18 min: $P < 0.001$). Data from the control condition suggested that physical education was supplying 18 (12%) of the recommended 150 minutes of physical activity per school week. It was estimated that during a 36-week school year, students in specialist-led classes spent about 13 more hours in moderate-to-vigorous physical activity than

students in control classes. If school-based programs intended to affect morbidity and mortality of young children, then programmatic efforts must have positive impact on health behaviors both during implementation of the intervention and these changes must be maintained over the long term (Hoelscher, Day, Lee, Frankowski, Kelder, Ward, & Scheurer, 2004). School-based physical education programs provided both the immediate effects of the activity and sustained effects through encouragement of lifelong activity patterns (Troiano & Flegal, 1998).

Physical Assessment Techniques

To date, a number of different techniques have been used to assess physical activity levels in the schools. These included direct observation, self report methods, heart rate monitors, and motion sensors such as pedometers and accelerometers (Trost, Kerr, Ward, & Pate, 2001). However, it was generally difficult to accurately measure activity levels in children despite the various techniques that were available (Armstrong & Bray, 1991). When selecting a measurement method, each measure has specific advantages and disadvantages that must be considered. Physical activity assessment techniques should be: 1) socially acceptable; 2) not encumber the adolescent with awkward equipment; and 3) minimally manipulate the adolescent's usual physical activity pattern. Intensity, duration, frequency, and the method of activity should be monitored for extended periods of time if a true picture of habitual physical activity is required. Health educators have used both subjective and objective techniques to document physical activity habits.

Subjective measures commonly used in the school systems include direct observation and self report methods such as questionnaires, and pulse counting. Direct observation of movement was a long-established practical way to measure physical activity. Observers are trained to note behavioral information about the types of activities, the time spent in each activity, and their

frequency of performance (Hussey, Bell, & Gormley, 2007). Direct observation techniques evaluated the behavioral aspects of physical activity and were well suited for studies on children (Welk, Corbin, & Dale, 2000). However, there were no clear specifications about the duration of the observation to attain acceptable daily consistency. Drawbacks of direct observation included the relatively high experimenter burden, the potential reactivity of the student participant to the presence of an observer (Puhl, Greaves, & Hoyt, 1990) and the lack of replication. Armstrong and Welsman (1997) stated that direct observation was labor-intensive, time consuming, and costly. Events studied must be observable and codeable and observers or video cameras needed to be in the same environment as the subject. Direct observation can capture valuable short term patterns and sudden changes in children's physical activity but was impractical to follow a child for a full day and few long-term direct observation studies had been undertaken with children.

Other researchers used self-report methods including questionnaires, interview recall, activity diaries, and mail surveys. Self-report instruments provided a convenient way to assess activity patterns on large populations (Welk et al., 2000). One of the more common self report methods in measuring physical activity was the use of questionnaires. Hussey et al. (2007) stated that questionnaires are frequently used when measures of physical activity used in large-scale studies need to be simple and inexpensive; where time and manpower are limited and/or where numbers to be assessed are large. Questionnaires and interviews are frequently the method of collecting data on physical activity in epidemiological studies.

However, the sporadic nature of children's physical activity made these activities difficult to recall, quantify and categorize (Bailey, Olson, & Pepper, 1995). The lower cognitive functioning of children compared to adults reduced their ability to accurately recall intensity frequency and especially duration activities (Sallis, 1991). Hussey et al. (2007) stated that

validity for all questionnaires is difficult to establish due to the lack of a gold-standard criterion against which to compare the measurement in question.

Much activity in young children is spontaneous, non-organized activities which cannot be classified easily and therefore, may not be "memorable" in terms of frequency, duration, and intensity, which is the type commonly asked for in questionnaires. (Hussey et al., 2007). Welk et al. (2000) stated that children and adolescents have some degree of overestimation from self-report forms that were attributed to an exaggerated perception of time and effort. They could indicate that they were active while playing a sport or game, but may have only been moving for a portion of the time which caused them to view even short bouts of activity significant. This variability made it difficult to draw firm conclusions about activity levels in children and adolescents based on self-report. It was difficult to ascertain at what age children become able to produce meaningful questionnaire data, but Pate (1993) suggested that children under the age of 12 years cannot recall activities accurately and were unable to quantify the time-frame of activity.

Pulse counting by children and adolescents in school settings has been a conventional method in determining exercise intensity. Erdmann, Dolgener, and Hensley (1998) investigated the accuracy of self-pulse counting in 63 middle school-aged boys as a method of measuring exercise intensity. The results indicated that 15 second pulse counts produce heart rate values lower than those obtained by a telemetry system. The authors recommended that a monitoring device should be used to better measure pulse rates.

Care must be taken when applying self report measures. Often self-report measures were used to assess physical activity and are commonly subject to recall errors and inaccurate perception of one's activity behavior (Freedson & Miller, 2000). With the current public health

emphasis on accumulating 30 minutes of moderate intensity physical activity it becomes imperative to use more objective methods for quantifying this behavior in the same way we measure and monitor blood lipids, blood pressure, and body mass (Freedson et al., 2000).

A wide range of objective and subjective methods have been used to quantify physical activity behavior of adults and children. However, objective measures with real-time data storage capabilities seem to offer a distinct advantage over subjective measures since they provide reliable information on patterns of physical activity within a given day or several days (Trost, 2001). In the past few years, objective techniques for assessment of physical activity have been developed making it possible to assess large samples of youth (Corbin et al., 2004). Activity motion monitors such as accelerometers, pedometers, and heart rate monitors provide reliable and objective measures of total body movement. Pedometers are small digital devices that detect steps by responding to vertical accelerations (Corbin et al., 2004). Rowlands, Eston, and Ingledew (1997) suggested that pedometers were inexpensive, re-useable, and useful tools for large scale studies well suited for physical activity assessments in adolescents.

Nonetheless, pedometers have limitations. Pedometers measured only ambulatory movements, and cannot detect other modes of physical activity common to children and adolescents (e.g., bicycling, climbing, and swimming), and cannot assess the intensity of the activity (Corbin et al., 2004). Welk et al. (2000) stated that pedometers do not have time sampling capabilities nor do they provide detail about frequency or intensity of physical activity. Energy expenditure estimates would likely be inaccurate due to many assumptions needed to calculate this from step counts.

Accelerometers measure accelerations produced by body movements. They can be worn underneath clothes if necessary and do not prevent participation in common activities and sports.

Trost, Pate, Freedson, and Sallis (2000) examined the minimal number of days required to assess usual physical activity in 381 children using accelerometers. A 7-day monitoring protocol provided reliable estimates of usual physical activity behavior in children and adolescents. This protocol accounted for the important differences in weekend versus weekday physical activity behavior as well as differences in activity patterns within a given day.

However, accelerometers were also limited in assessing movements such as cycling and climbing and were restricted to torso movements. Ham, Reis, Strath, Dubose, and Ainsworth (2007) stated that accelerometers underestimated energy expenditure for lifestyle activities of daily living and static activities. Hendelman, Miller, Baggetr, Debold, and Freedson (2000) conducted a study in which accelerometers were used to measure moderate-intensity physical activity. Household activities such as sweeping and mopping floors had the same measured metabolic equivalents values as slow walking but household activities were associated with only 500-700 counts per minute mean accelerometer counts than walking (2000 counts per minute).

One of the most common and more successful field measures used by physical educators and researchers to measure physical activity levels was the use of heart rate monitors. The use of heart rate monitors as a means of increasing physical activity has practical implications. This device allowed students to receive feedback and monitor their intensity levels in the form of heart rate measures (Grissom, Ward, Martin, & Nicole, 2005). Heart rate monitors provided precise details about the frequency, intensity, duration, and time of day of individual episodes of physical activity and can be used to estimate daily energy expenditure (Claytor, Horn, & Iannotti, 2004). In addition, technological advancements now enabled heart rate recorders to store information over a period of days or weeks (Strath, Swartz, Bassett, O'Brien, King, et al., 2000).

A substantial amount of research examined the use of heart rate monitors in adults in various settings but only few studies have examined their use in children and adolescents. Janz, Golden, Hansen, and Mahoeny (1992) assessed the usefulness of whole-day monitoring as a quantitative measure of physical activity in 76 children and adolescents 6 to 17 years of age. Physical activity was measured during a typical summer day using a light-weight, nonrestrictive heart rate telemetry unit. A 12-hour recall and a simple self-rating of usual physical activity questionnaire were administered on the same day. The heart rate telemetry data were compared with data gathered by a 12-hour recall questionnaire and a simple rating of normal physical activity. The recall questionnaire contained appropriate instructions written in simple language, pictures of common activities, and memory-enhancing procedures. Results suggested that for children whole-day heart rate monitoring was an objective, non-obstructive method for measuring physical activity and was an influential mediating factor for activity. Activity, measured by heart rate, was significantly related to questionnaire recall ($r = 0.50$) and self-rating ($r = 0.35$) suggesting that heart rate monitoring is an appropriate measure of physical activity of children. However, comparing heart-rate monitoring to subjective methods of analyzing physical activity may be questionable.

Armstrong, Welsman, and Kirby (2000) examined longitudinally (3 years) the influence of age, sex, maturity, body mass and body fatness on the physical activity of 11-13 year olds from Exeter, United Kingdom. At the onset, subjects were 11.0 (0.4) years old and data were available on 202, 143, and 160 subjects in years 1 to 3 respectively. Body mass, triceps and subscapular skinfold thickness were recorded and 3-day continuous heart rate monitoring were used to estimate physical activity on each annual measurement occasion. Multilevel regression modeling examined age-, sex-, and maturity-related changes in time spent with heart rate above

139 (moderate activity) and 159 (vigorous activity) beats per minute for at least 10, 20 and 30 minutes.

Results showed that young people experiencing sustained physical activity with heart rates above proposed thresholds (139-159bpm) declined with age, and by age of 13 years, no girls whatsoever and only 2.5% of boys experienced the equivalent of a daily 20 minute period of moderate (heart rate > 139bpm) physical activity . No subjects experienced 3 or more 20 minute period of vigorous (heart rate > 159bpm) physical activity in the final year of the study, with 82.7% of boys and 86.1% of girls not demonstrating a single 20 minute period of vigorous activity during the monitoring period. In the final year of the study, 40% of the subjects did not record a single 10 minute period of moderate physical activity.

Mitchell et al. (2001) examined the amount of time11-14 year old students spent in a target heart rate range during an intensity-controlled 1 mile run. Students in grades 6^{th}, 7^{th}, and 8^{th} (N = 311) were recruited for the study from a suburban middle school where physical activity education was taught 5 days per week. Target heart rate reserve was calculated for each student using 75% ± 3% of heart rate reserve. Students were given proper instructions and demonstrations on how to wear and use the heart rate monitor. Heart rate monitors were used to measure 1-mile time and heart rate data. Participants were instructed to keep their heart rate in a range of 75% of their heart rate range.

Female students spent 3.69 min (36%) in heart rate range and 3.33 min (30%) above heart rate range, and male students spent 3.81 min (39%) in heart rate range and 2.84 min (28%) above heart rate range. Overall, the participants spent 67% of time in or above their heart rate reserve during an intensity-controlled 1 mile run. Teaching students to exercise within a heart rate range may promote fitness by emphasizing time in the heart rate range instead of placing

emphasis on the fastest 1-mile time.

Heart rate monitors have been shown to be effective tools in providing individualized feedback to students, enabling them to monitor and adjust their personal intensity of exercise (Kohl, Fulton, & Caspersen, 2003). Hussey et al. (2007) stated that advances in micro-electronics had made it possible to detect and store impulses over long time periods using unobtrusive equipment. The development of reliable heart rate recorders that were small in size and weight, but had maximal storage capacity, had enabled not just athletes to use these monitors to determine exercise training zones, but had also permitted the measurement of activity levels over long time periods. The volume of physical activity (frequency, duration, and intensity) can be estimated from continuous heart rate monitoring using such devices. This was an excellent way to teach student accountability in the classroom. Physical education teachers controlled exercise intensity by having students adjust their running speed via feedback from a heart rate monitor (Mitchell et al., 2001). In addition, students can take ownership of their health in such a way that was beneficial to them. During the 1990-1991 school year, (Strand & Reeder, 1993a) conducted Phase I of a 3 phase study designed to determine time in the training zone of middle school students during physical education activities. Each class period was 45 minutes in length. uring the year long study heart rate intensity levels were recorded with Polar Vantage XL heart rate monitors. Training zones for each subject were determined by obtaining a resting heart rate and using the Karvonen formula to compute the 60% and 90% lower and upper training zone limit. Results showed intensity was above the lower boundary of the training zone (60% of heart rate reserve) for a mean of 13.2 minutes per day. Only 3% of the subjects were within or above their intensity level for a mean of 20 or more minutes per day. Teaching strategies designed to increase the amount of time spent in a training zone and to increase the percentage of students

exercising at the intensity level for the recommended period of time were suggested.

During the second semester of the 1991-1992 school year, Phase II was conducted. The Phase II study used procedures similar to those used in the Phase I study but incorporated teaching strategies as suggested by (Strand & Reeder, 1993b). Rather than follow students for an entire school year the Phase II study followed students in 4 selected team activities (basketball, volleyball, soccer, and football). The purpose of the Phase II study was to determine time in the training zone for middle school physical education students and to determine the percentage of students meeting activity standards as stated in Objective 1.3 of Healthy People 2000. Objective 1.3 of Healthy People 2000 stated to increase to at least 60% the proportion of people age 6 and older who participate in moderate physical activities 3 or more days per week for 20 or more minutes per day.

Phase II consisted of 121 male physical education students from a middle school located in Northern Utah. The subjects, 12 and 13 years old, represented 4 different class periods conducted during the second semester of the school year. Females were not included in this study because physical education classes in this particular middle school are not co-educational. The class format for the 4 team activities was the same as that used in Phase I.

Results from Phase II were compared with those of in Phase I. Results from Phase II revealed that subjects were within or above their recommended training zone 50.3% of total class time, approximately 17.6 minutes per day. While participating in volleyball, soccer, football, and basketball subjects were within or above their training zones for 12.5, 15.3, 20.9, and 22.1 minutes, respectively. Furthermore, it was found that 31% of all subjects were within or above their training zone for 20 or more minutes. Thirty-one percent of the Phase II study actually met the activity standard as suggested in Objective 1.3 of Healthy People 2000 for daily duration of

time in activity, an increase of 25% from the Phase I study. A comparison of the results from Phase I and Phase II studies indicated that the implementation of selected teaching changes and heart rate intensity feedback positively affected the duration of time within or above a predetermined training zone for students in the physical education activities of basketball, football, volleyball, and soccer and increased the percentage of students who were within or above their training zones for at least 20 minutes.

However, numerous factors influenced heart rate under resting conditions and resulted in considerable error when heart rate monitors were used for extended periods of monitoring physical activity (Welk et al., 2000). Hussey et al. (2007) stated that several limitations found with heart rate measures in physical activity include: heart rate could be elevated by emotional stress independent of any change in oxygen uptake and the fitter the subject, the higher the stroke volume and the lower the heart rate for any given workload. Welk, Corbin, and Kampert (1998) investigated whether the Tritrac-R3D activity monitor or heart rate was the more useful measure to determine objective assessments of physical activity. Convergent validity of both instruments was established against a direct observation measure using the Children's' Activity Record System for physical activity. The activity assessment used on the participants (ages 10-12 years) involved 3 days of activity monitoring with both a Tritrac and heart rate monitor. The direct observation was conducted during 2 specific time intervals during the children's normal school day: a classroom time period (40min) and a physical education time period (30min). Results showed that heart rate indicators correlated highly with a direct observation measure under physically active conditions in physical education ($r = .79$), but they correlated weakly under inactive conditions in the classroom ($r = .49$). While this type of error affected measures of mean heart rate, it did not affect estimates of total minutes of activity. Collectively, the

combination of Tritrac and heart rate monitor provided little advantage over the assessment provided by either measure alone.

Martin, Grissom, Ward, and Lenders (2003) investigated the influence of wearing a heart rate monitor on student activity levels in elementary physical education. They examined student activity levels when the focus of lesson objectives included skill and tactical skill development in addition to maintaining moderate to vigorous physical activity for 50% of the class time. Results suggested the effectiveness of the teacher rather than the heart rate monitor was responsible for student activity levels.

Teaching students to exercise in an aerobic target heart rate zone may help students learn to exercise within their own optimum intensity levels (Mitchell et al., 2001). American College of Sports Medicine (1990) has stated that the amount of time spent in a prescribed training zone was an important variable in developing cardiovascular fitness. By making exercise enjoyable and teaching that exercise need not be strenuous to be effective encouraged adolescents to incorporate more physical activity in their lifestyle (Mitchell et al., 2001). Heart rate monitor technology has provided both exercise enthusiasts and professionals the means to measure and then apply proper heart rate intensity for exercise prescription in adults and children (Terbizan, Dolezal, & Albao, 2002). The technological advances made with heart rate monitors allow a relatively objective estimate of physical activity based on the assumption that children who spend longer periods of time with elevated heart rates generally were more active than those whose heart rates remain in the lower ranges (Armstrong & Welsman, 2006).

Accurate assessment of physical activity in adolescents was necessary to identify levels of activity in order to assess the effectiveness of intervention programs designed to increase physical activity (Sirard & Pate, 2001). Care must be taken to select criterion measures that

reflect appropriate physical activity guidelines for adolescents. Interpretations of adolescent's physical activity levels depended on thresholds set for the intensity of physical activity. Depending on the type of method used in assessing physical activity, patterns of adolescent activity varied considerably. If accuracy is paramount, it was recommended that adolescents use some sort of monitoring device that measured quantitative data objectively, accurately and reliably.

This was important in the development of physical intervention programs and the assessment of their effectiveness since different techniques measure different parameters of physical activity. The different measurement techniques could account for the often weak relationships between measurements of the same children and adolescents. To interpret the habitual physical activity of adolescents, measurement issues must be considered and the data evaluated in the context of the methodology used.

Physical education should be viewed not only as preparation for future life but also as an important part of the educational life (Greenwood & Stillwell, 2001). There is an urgent need for the nation's school systems to systematically and effectively promote and assess behaviors and methods that will prevent the development of health risks as well as establish an efficient approach to keep adolescents active as they move toward adulthood. Close attention must be placed on how effectively to measure adolescents' fitness levels to assure that they were getting the benefits of regular-daily exercise.

A review of physical activity literature suggested that regular participation in physical education classes can make an important contribution to the health and well-being of adolescents provided that students have opportunities to participate in a variety of meaningful physical activities that enable them to achieve health-related levels of physical fitness (National

Association for Sport and Physical Education, 2004). Physical education has the potential to impact adolescents' developing knowledge, attitudes, beliefs, and behaviors about physical activity in positive and meaningful way through the middle school curriculum that may endure across the lifespan (Mohr et al., 2006).

REFERENCES

1. Aaron, D.J., Kriska, A.M., & Dearwater, S.R. (1993). The epidemiology of leisure physical activity in an adolescent population. *Medicine Science in Sports and Exercise, 25*(7): 847-853.
2. Aaron, D.J., Stori, K.L., Robertson, R.J., Kriska, A.M., & LaPorte, R.E. (2002). Longitudinal study of the number and choice of leisure time physical activities from mid to late adolescence: Implications for school curricula and community recreation programs. *Archives of Pediatrics and Adolescent Medicine, 156*: 1075-1084.
3. Adler, N.E., Boyce, T., & Chesney, M.A. (1994). Socioeconomic states and health: The challenges of the gradient. *American Psychology, 49: 15-24.*
4. Allen, M. L., Elliott, M.N., Morales, L.S., Diamant, A.L., Hambarsoomian, K., & Schuster, M.A. (2007). Adolescent participation in preventative health behaviors, physical activity and nutrition: Differences across immigrant generations for Asians and Latinos compared with whites. *American Journal of Public Health, 97*(2): 337-343.
5. Alpert, B.S. & Wilmore, J.H. (1994). Physical activity and blood pressure in adolescents. *Pediatric Exercise Science, 6*: 361-380.
6. American College of Sports Medicine. (1990). The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness in healthy adults. *Medicine and Science in Sport and Exercise, 22*: 265 274.
7. Armstrong, N. & Bray, S. (1991). Physical activity patterns defined by continuous heart

rate monitoring. (activity patterns of British primary schoolchildren). *Archives of Disease in Childhood, 66*(2): 245-248.

8. Armstrong, N. & Welsman, J. (1997). Young people and physical activity. *Oxford: Oxford University Press.*

9. Armstrong, N. & Welsman, J.R. (2006). The physical activity patterns of European youth with reference to methods of assessment. *Sports Medicine, 36*(12): 1067-1086.

10. Armstrong, N., Welsman, J., & Kirby, B. (2000). Longitudinal changes in 11-13 year olds' physical activity. *Acta Paediatr, 89*: 775-780.

11. Bailey, R.C., Olson, J., & Pepper, S.L. (1995). The level and tempo of children's physical activities: an observational study. *Medicine Science in Sports and Exercise, 27*(7): 1033-1041.

12. Baranowski, T. & Bouchard, C. (1992). Assessment, prevalence, and cardiovascular benefits of physical activity and fitness in youth. *Medicine and Science in Sports Exercise, 24*(6): 237-247.

13. Barroso, C.S., McCullum-Gomez, C., Hoelscher, D.M., Kelder, S.H., & Murray, N.G. (2005). Self-reported barriers to quality physical education by physical education specialists in Texas. *Journal of School Health, 75*(8): 313-319.

14. Baquet, G., Berthoin, S., & Praagh, E.V. (2002). Are intensified physical education sessions able to elicit heart rate at a sufficient level to promote aerobic fitness in adolescents. *Research Quarterly for Exercise and Sport, 73*(3): 282-289.

15. Blessing, D.L., Keith, R.E., Williford, H.N., Blessing, M.E., & Barksdale, J.A. (1995). Blood lipid and physiological responses to endurance training in adolescents. *Pediatric Exercise Science, 7*: 192-202.

16. Bonhauser, M., Fernandez, G., Püschel, K., Yañez, F., Montero, J., Thompson, B., & Coronado, G. (2005). Improving physical fitness and emotional well-being in adolescents of low socioeconomic status in Chile: results of a school-based controlled trial. *Health Promotional International, 20*(2): 113-122.

17. Calfas, K.J. & Taylor, W.C. (1994). Effects of physical activity on psychological variables in adolescents. *Pediatric Exercise and Science, 6*: 406-423.

18. Chase, M., Vealy, R., Galli, N., Evers, J., Klug, J., & Reichert, K. (2007). What's in it for me? An intervention to increase physical activity among adolescence in physical education: do your students map their goals? *The Journal of Physical Education, Recreation & Dance, 78*(1): 34-40.

19. Claytor, R.P., Horn, T.S., & Iannotti, R.J. (2004). Heart rate monitoring as a measure of physical activity in children. *Medicine and Science in Sports and Exercise, 36* (11): 1964-1971.

20. Committee on Prevention of Obesity in Children and Youth. (2005). Preventing childhood obesity: Health in balance. *Washington, DC: Institute of Medicine.*

21. Corbin, C.B., Pangrazi, R.P., & Le Masurier, G.C. (2004). Physical activity for children: Current patterns and guidelines. *Research Digest, 5*(2): 132-140.

22. Crews, D.J. & Lochbaum, M.R. (2004). Aerobic physical activity effects on psychological well-being in low income Hispanic children. *Perceptual & Motor Skills, 98*(1): 319-324.

23. Del Rio-Navarro, P.E., Velasquez-Monroy, O., & Sanchez-Castillo, C.P. (2004). The high prevalence of overweight and obesity in Mexican children. *Obesity Research, 12*: 215-223.

24. Dowda, M., Pate, R.R., Felton, G.M., Saunders, R., Ward, D.S., Dishman, R.K., & Trost, S.G. (2004). Physical activities and sedentary pursuits in African and Caucasian girls. *Research Quarterly for Exercise and Sport, 74*(4): 352-361.

25. Dwyer, J.J., Allison, K.R., Goldenberg, E.R., Fein, A.J., Yoshida, K.K., & Boutillier, M.A. (2000). Adolescent girls' perceived barriers to participation in physical activity. *Adolescence, 41*(161): 75-89.

26. Eakin, B.L., Villarruel, A.M., Jemmott, J.B., Jemmott, L.S., Ronis, D.L., & Bigelow, A. (2005). Physical activity in Latino adolescents: understanding influences on activity intentions. *Hispanic Healthcare International, 3*(3): 125-131.

27. Epstein, L.H., Coleman, K.J., & Myers, M.D. (1996). Exercise in treating obesity in children and adolescents. *Medicine and Science in Sports and Exercise, 28*(4): 428-435.

28. Epstein, L.H., Valoski, A.M., & Vara, L.S. (1995). Effects of decreasing sedentary behavior and increasing activity on weight change in obese children. *Health Psychology, 14*(2): 109-115.

29. Erdmann, L.D., Dolgener, F.A., & Hensley, L.D. (1998). A comparison of postexercise heart rates by telemetry and self-pulse palpation in middle school-aged boys. *Measurement in Physical Education and Exercise Science, 2*(4): 199-204.

30. Faigenbaum, A.D. (2001). Strength training and children's health. *The Journal of Physical Education, Recreation & Dance, 72*(3): 24-32.

31. Faigenbaum, A.D. & Mediate, P. (2006). Effects of medicine ball training on fitness performance of high-school physical education students. *The Physical Educator, 63*(3): 160-167.

32. Faigenbaum, A.D., Milliken, L.A., LaRosa, R., Burak, B.T., Doherty, C.L., &

Westcott, W.L. (2002). Comparison of 1 ad 2 days per week of strength training in children. *Research Quarterly for Exercise and Sport, 73*(4): 416-425.

33. Faigenbaum, A., Zaichkowsky, L., Westcott, W., Micheli, L., & Fehlandt, A. (1993). The effects of a twice-per-week strength-training program on children. *Pediatric Exercise Science, 5*: 339-346.

34. Fairbrother, A., Jones, M.A., & Hitchen, P.J. (2005). Reliability and concurrent validity of the multi-stage shuttle run test in adolescents athletes. *Journal of Sport Sciences, 23*(2): 196-200.

35. Falk, B.,& Tenebaum, G. (1996). The effectiveness of resistance training in children: A meta-analysis. *Sports Medicine, 22:* 176-186.

36. Freedson, P.S., & Miller, K. (2000). Objective monitoring of physical activity using motion sensors and heart rate. *Research Quarterly for Exercise and Sport, 71*(2): 21-28.

37. Frenn, M. & Malin, S. (2003). Diet an exercise in low-income culturally diverse middle school students. *Public Health Nursing, 20*(5): 361-368.

38. Frenn, M., Malin, S., Bansal, N., Delgado, M., Greer, Y., Havice, M., Ho, M. & Schweizer, H. (2003). Addressing health disparities in middle school students' nutrition and exercise. *Journal of Community Health Nursing, 20*(1): 1-14.

39. Goodman, F., Slap, G.B., & Huang, B. (2003). The public health impact of socioeconomic states on adolescent depression and obesity. *American Journal of Public Health, 93*(11): 1844-1850.

40. Greenwood, M. & Stillwell, J. (2001). Activity preferences of middle school physical education students. *Physical Educator, 58*(1): 26-30.

41. Grissom, T., Ward, P., Martin, B., & Leenders, N. (2005). Physical activity in physical education. *Family Community Health, 28*(2): 125-129.

42. Grissom, T., Ward, P., Martin, B., & Nicole, Y.J (2005). Physical activity in physical education: Teacher or technology effects. *Family and Community Health, 28*(2): 125-130.

43. Guo, S.S. & Chomlea, W.C. (1999). Tracking of body mass index in children in relation to overweight in adulthood. *American Journal of Clinical Nutrition, 70*: *145-148.*

44. Ham, S.A., Reis, J.P., Strath, S.J., Dubose, K.D., & Ainsworth, B.E. (2007). Discrepancies between methods of identifying objectively determined physical activity. *Medicine and Science in Sports and Exercise, 39*(1): 52-58.

45. Harrell, T.K., Davy, B.M., Stewart, J.L., & King, D.S. (2005). Effectiveness of a school-based intervention to increase health knowledge of cardiovascular disease risk factors among rural Mississippi middle school children. *Southern Medical Journal, 98*(12): 1173-1180.

46. Healthy People 2000. (1991). National Health Promotion and Disease Prevention Objectives. *Washington, DC: Public Health Service: DHHS Publication PHS 91-50212.*

47. Hendelman, D., Miller, K., Baggetr, C., Debold, E., & Freedson, P. (2000). Validity of accelerometry for the assessment of moderate intensity physical activity in the field. *Medicine and Science in Sports and Exercise, 32*(9): 442-449.

48. Hoelscher, D.M., Day, R.S., Lee., E.S., Frankowski, R.F., Kelder, S.H., Ward, J.L., & Scheurer, M.E. (2004). Measuring the prevalence of overweight in Texas schoolchildren. *American Journal of Public Health, 94*(6): 1002-1008.

49. Hoelscher, D.M., Feldman, H.A., Johnson, C.C., Lytle, L.A., Osganian, S.K., Parcel, G.S., Kelder, S.H., Stone, E. J., & Nader, P.R. (2004). School-based health education programs can be maintained over time: results from the CATCH institutionalization study. *Preventative Medicine, 38*(5): 594-606.

50. Hoelcher, D.M., Perez, A., Lee, E.S., Sanders, J.K., Kelder, S.H., et al. (2005). School physical activity and nutrition (SPAN) III Survey, 2004-2005. *UT School of Public Health.*

51. Hussey, J., Bell., & Gormley, J. (2007). The measurement of physical activity in children. *Physical Therapy Reviews, 12*: 52-58.

52. Ignico, A.A. & Mahon, A.D. (1995). The effects of a physical fitness program on low-fit children. *Research Quarterly for Exercise and Sport, 66*(1): 85-90.

53. Jain, A. (2004). What works for obesity? A summary of the research behind obesity interventions. London: *BMJ Publishing Group.*

54. Janz, K.F., Golden, J.C., Hansen, J.R., & Mahoeny, L.T. (1992). Heart rate monitoring of physical activity in children and adolescents: the Muscatine study. *Pediatrics, 89*(2): 256-2161.

55. Kann, L., Grunbaum, M.L., McKenna, H., Wechsler, H., & Galuska, D.A. (2004). Competitive foods and beverages available for purchase in secondary schools-selected sites, United States. *Journal of School Health, 75*(10): 370-375.

56. Klijn, P.C., Bann-Slootweg, O.H., & Van Stel, H.F. (2007). Aerobic exercise in adolescents with obesity: preliminary evaluation of a modular training program and the modified shuttle test. *BMC Pediatrics, 7*(19): 19-24.

57. Kohl, H.W., Fulton, J.E., & Caspersen, C.J. (2003). Assessment of physical activity

among children and adolescents: a review and a synthesis. *Preventive Medicine, 31*: 54-76.

58. Lacy, A.C. & LaMaster, K.J. (1990). Analysis of fitness activities in junior high school. *Physical Educator, 47*(4): 1-3.

59. Luepker, R.V., Perry, C.L., McKinlay, S.M., Naden, P.R., Parcel, G.S., Stone, E.J., Webber, L.S., Feldman, H.A., Johnson, C.C., Kelder, S.H., & Wu, M. (1996). Outcomes of a field trail to improve children's dietary patterns and physical activity (CATCH). *Journal of the American Medical Association, 275:* 768-776.

60. Martin, B., Grissom, T., Ward, P., & Lenders, Y.J. (2003). Effects of wearing heart rate monitors on elementary students' activity levels during a team handball unit. *Research Quarterly for Exercise and Sport, 74*(1): 49-52.

61. Masurier, G.E. & Corbin, C.B. (2006). Top 10 reasons for quality physical education. *The Journal of Physical Education, Recreation, & Dance, 77*(6): 44-54.

62. Melville, D.S., & Hammermeister, J. (2006). Pre-service physical educators: Their demographics, wellness practices, and teaching interests. *Physical Educator, 63*(2): 69-77.

63. Mier, N., Ory, M.G., Zhan, D., Wang, S., & Burdine, J.N. (2007). Levels and correlates of exercise in a border Mexican American population. *American Journal of Health Behavior, 31*(2): 159-169.

64. Mitchell, B.M., Strasburger, J.F., & Donkin-Kursar, S. (2001). Heart rates during an intensity-controlled one-mile run in 11-to-14 year old children. *Measurement in Physical Education & Exercise, 5*(2): 109-115.

65. Mohr, D.J., Townsend, S., & Pritchard, T. (2006). Rethinking middle school physical

education: Combining lifetime leisure activities and sport education to encourage physical activity. *Physical Educator, 63*(1): 18-30.

66. Morris, F., Naughton, G., Gibbs, J., Carlson, J., & Wark, J. (1997). Prospective ten-month exercise intervention in premenarcheal girls: Positive effects on bone and lean mass. *Journal of Bone Mineral Research, 12:* 1453-1462.

67. Morrow, J.R. & Freedson, (1994). Relationship between habitual physical activity and aerobic fitness in adolescents. *Pediatric Exercise Science, 6:* 315-329.

68. Must, A. & Strauss, R.S. (1999). Risks and consequences of childhood and adolescent obesity. *International Journal of Obesity Relative to Metabolic Disorders, 23*: 2-11.

69. National Association for Sport and Physical Education. (2005). Physical activity for children: A statement of guidelines for children 5-12. 2nd Ed. Reston, VA.

70. National Association for Sport and Physical Education. (2004). Moving into the future: National standards for physical education. 2nd Ed. Reston, VA.

71. National Center for Chronic Diease Prevention and Health Promotion. (2001). Physical activity and good nutrition: Essential elements to present chronic diseases and obesity. http://www.cdc.gov/nccdphp/dnpa/dnpaaag.htm.

72. National Center for Health Statistics. (1999). Healthy people 2000 review, 1998-1999. Hyattsville, MD: *Public Health Science*.

73. Ogden, C.L., Carroll, M.D., & Curtin, L.R. (2006). Prevalence of overweight and obesity in the United States, 1999-2004. *Journal of American Medical Association, 295*: 1549-1555.

74. Ogden, C.L., Carroll, M.D., & Flegal, K.M. (2008). High body mass index for age among US children and adolescents. *Journal of the American Medical Association,*

299(20): 2401-2405

75. Ogden, C.L., Flegal, K.M., & Carroll, M.D. (2002). Prevalence and trends in overweight among US children and adolescents, 1999-2000. *Journal of the American Medical Association, 288*(14): 1728-1732.

76. Owens, S., Gutin, B., Allison, J., Riggs, S., Ferguson, M., Litaker, M., & Thompson, W. (1999). Effect of physical training on total and visceral fat in obese children. *Medicine and Science in Sport Exercise, 31*: 143-148.

77.Park, M.K., Menard, S.W., & Schoolfield, J. (2001). Prevalence of overweight in a triethnic pediatric population of San Antonio, TX. *International Journal of Obesity, 25: 409-416.*

78. Pate, R.R. (1993). Physical activity assessment in children and adolescents. *Critical Review in Food Science and Nutrition, 33*: 321-327.

79. Pate, R.R., Davis, M.G., Robinson, T.N., Stone, E.J., McKenzie, T.L., & Young, J.C. (2006). Promoting physical activity in children and youth: A leadership role for schools. *American Heart Association Inc, 14*: 1214-1224.

80. Pate, R.R., Pratt, M., & Blair, S.N. (1995). Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *Journal of the American Medical Association, 273*(5): 42-407.

81. Puhl, J., Greaves, K.A. & Hoyt, M. (1990). Children's activity rating scale (CARS): description and evaluation. *Research Quarterly in Exercise and Sport, 61*(1): 26-36.

82. Rowlands, A.V., Eston, R.G., & Ingledew, D.K. (1997). Measurement of physical

activity in children with particular reference to the use of heart rate and pedometry. *Sports Medicine, 24*: 258-272.

83. Ryan, S., Fleming, D. & Maina, M. (2003). Attitudes of middle school students toward their physical education teachers and classes. *Physical Educator, 60*(2), 28-37.

84. Sallis, J.F. (1991). Self-report measures of children's physical activity. *Journal of School Health, 61*(5): 215-224.

85. Sallis, J.F., McKenzie, T.L., & Alcaraz, J.E. (1993). Habitual physical activity and health-related physical fitness in fourth-grade children, *American Journal of Disease in Children, 147*: 890-896.

86. Sallis, J.F., McKenzie, T.L., Alcaraz, J.E., Kolody, B., Faucette, N., & Hovell, M.F. (1997). The effects of a 2-year physical education program (SPARK) on physical activity and fitness in elementary school students. *American Journal of Public Health, 87*(8): 1328-1334.

87. Schmitz, K.H., Harnack, L. J., David, R., Gao, S., Lytle, L. et al. (2004). Reliability and validity of a brief questionnaire to assess television viewing and computer use. *Journal of School Health, 74*(9): 370-377.

88. Schnirring, L. (2005). Fitness-focused physical education reaps benefits. *Physician & Sportsmedicine, 33*(11): 4-8.

89. Shane, P. (2006). Physical education in the middle school. *Primary & Middle Years Educator, 4*(2): 129-134.

90.Simon, C., Wagner, A., DiVita, C., Rauscher, E., Klein-Platat, C., et al. (2004). Intervention centered on adolescents' physical activity and sedentary behavior (ICAPS): concept and 6-month results. *International Journal of Obesity, 28*: 96-

103.

91. Simons-Morton, B.G., McKenzie, T.J. & Stone, E. (1997). Physical activity in a multiethnic population of third graders in four states. *American Journal of Public Health, 87:* 45-50.

92. Simons-Morton, B.G., Taylor, W.C., & Snider, S.A. (1997). Observed levels of elementary and middle school children's physical activity during physical education classes. *Preventative Medicine, 23*: 437-441.

93. Simons-Morton, B.G., Taylor, W.C., Snider, S.A., & Huang, M.S. (1993). The physical activity of fifth grade students during physical education classes. *American Journal of Public Health, 83*(2): 262-264.

94. Sirard, J.R. & Pate, R.R. (2001). Physical activity assessment in children and adolescents. *Sports Medicine, 31*: 439-454.

95. State Legislature of the State of Texas, Section 28.002. (2001). Education code bill number TX 77RSB19.

96. Strand, B. & Reeder, S. (1993a). Analysis of heart rate intensity levels during middle school physical education activities. *Journal of Physical Education, Recreation and Dance, 64*(3): 85-91.

97. Strand, B. & Reeder, S. (1993b). Using heart rate monitors in research on fitness levels of children in physical education. *Journal of Teaching in Physical Education, 12:* 215-220.

98. Strath, S.J., Swartz, A.M., Bassett, D.R., O'Brien, W.L., King, G., & Ainsworth, B.E. (2000). Evaluation of heart rate as a method for assessing moderate intensity physical activity. *Medicine and Science in Sports and Exercise, 32*(9): 465-470.

99. Stovitz, S.D., Schwimmer, J.B., Martinez, H., & Story, M.T. (2008). Pediatric obesity, the unique issues in Latino-American male youth. *Department of Family Medicine and Community Health of Minnesota, Minneapolis.*

100. Terbizan, D.J., Dolezal, B.A., & Albano, C. (2002). Validity of seven commercially available heart rate monitors. *Measurement in Physical Education and Exercise Science, 6*(4): 243-247.

101. Texas Department of State Health Services. (2005). Behavioral risk factor surveillance system. Risk factor: no lesuire time physical activity http://www.dshs.state.tx.us/chs/brfss/.

102. Troiano, R.P., & Flegal, K.M. (1998). Overweight children and adolescents: description, epidemiology, and demographics. (The causes and health consequences of obesity in children and adolescents). *Pediatrics, 101*(3): 497-505.

103. Trost, S.G. (2001). Objective measurement of physical activity in youth: Current issues, future directions. *Exercise in Sport Science Review. 29*: 32-36.

104. Trost, S.G., Kerr, L.M., Ward, D.S., & Pate, R.R. (2001). Physical activity and determinants of physical activity in obese and non-obese children. *International Journal of Obesity, 25*: 822-829.

105. Trost, S.G., Pate, R.R., Freedson, P.S., & Sallis, J.F. (2000). Using objective physical activity measures with youth: How many days of monitoring are needed? *Medicine and Science in Sports and Exercise, 32*(2): 426-431.

106. Trost, S.G., Saunders, R. & Ward, D.S. (2002). Determinants of physical activity in middle school children. *American Journal of Health Behavior, 26*(2): 95-102.

107. Welk, G.J., Corbin, C.B., & Dale, D. (2000). Measurement issues in the assessment of

physical activity in children. *Research Quarterly for Exercise and Sport, 71*(2): 59-77.

108. Welk, G.J., Corbin, C.B., & Kampert, G.B. (1998). The validity of the tritrac-R3D activity monitor for the assessment of physical activity II: Temporal relationships among objective assessments. *Research Quarterly for Exercise and Sport, 69*: 395-399.

109. Weltman, A., Janney, C., Strand, K., Berg, B., Tippit, S., Wise, J., Cahill, B., & Katch, F. (1986). The effects of hydraulic-resistance strength training in pre-pubertal males. *Medicine and Science in Sports and Exercise, 18:* 629-638.

110. Zapata, L.B., Bryant, C.A., McDermott, R.J., & Hefelfinger, J.A. (2008). Dietary and physical activity behaviors of middle school youth: The physical activity and nutrition survey. *Journal of School Health,* 78(1): 9-18.

APPENDIX C: PARENTAL CONSENT AND PARTICIPANT ASSENT FORM

El PASO

HUMAN PARTICIPANT REVIEW
PARENTAL PERMISSION

Your child has been asked to take part in a research project provided by the University of Texas at El Paso. The University asks that you give your signature as proof to allow your child to be in this project. The following information is provided to help you make a decision whether or not to let them participate.

The purpose of this project is to evaluate the "Polar's Borderland Heartbeats for Healthy Living" (PBHHL) pilot program in the El Paso Independent School District (EPISD) funded by the NASPE/Polar Heart Rate Monitor Grant. As the project is planned around existing physical education classes, the interventions listed in the PBHHL will be randomly assigned to each of the four classes. The four conditions will be: (a) Traditional Existing Group; (b) Aerobic Based Group; (c) Resistance Training Group; (d) Combination Group.

The traditional existing group will be taught using the current program in place at Guillen Middle School. The aerobic based group will use a variety of aerobic based activities. These include various forms of power walking, jogging, interval training, and Tae Bo, and various Latin, Hip Hop, and Salsa dances. The resistance training group will take part in resistance training to include free-weights, body weight exercises, and medicine ball training. The combination group will take part in a combination of aerobic and weight training activities. These include circuit training activities, conditioning and weight training drills and activities.

Your child will do the study during their PE class. All classes will be held in the big gym. S/he will have a fitness test to do before and after the study. They will wear the heart rate monitors during class period. They will do activities that are based on which condition group they are assigned to. The study will be 10 weeks long with a 4 week orientation explaining what they will be doing.

Risks associated with being in this study are small. Your child may feel muscle soreness, muscle stiffness, shortness of breathe, and/or general fatigue. If your child does not want to be in the study s/he will not be punished for it. If your child decides that s/he does not want to do the study anymore, s/he can stop at anytime without getting in trouble. If your child has a medical condition and feel that having her/him in the study will cause physical harm, please let us know.

The benefits of being in this study include;

- being fit
- better motor skills
- knowledge of how to live healthier
- feel better about themselves
- more confidence.

I understand that my child is being asked to do this study and that s/he can decide to stop at anytime. I have been given the chance to ask questions regarding the study. I understand that I may talk with any member of the research group if I want.

I understand that every effort will be made to keep my child's data private. A code number will be used for each participant at the start of the study. No names of participants or schools will be used in publication(s). My child's written and verbal responses will not be given out.

If you have questions or want more information, you may ask now or contact Chris Estrada (UTEP) at 915-329-5092, Dr. Rockie Pederson (UTEP) at 915 747-7258, or Don Disney (EPISD) at 915 881-2337. This project has been reviewed and approved by the University of Texas at El Paso Institutional Review Board. If you have questions about your experiences with the study, you may contact Lola Norton at (915) 747-8841 or irb.orsp@utep.edu.

I am fully aware of what is expected of my child's participation in this project. I know about the possible risks arising from it. I hereby agree to allow my son/daughter to be in this project. I have received a copy of this form.

_____ _____

(Signature of parent/legal guardian) (Date)

_____

(Printed name of parent/legal guardian)

_____

(Printed name of child participant)

_____ _____

(Signature of investigator) (Date)

_____ _____

(Signature of instructor/advisor) (Date)

EL PASO
REPASO DE PARTICIPANTES HUMANOS
PERMISO PATERNAL/MATERNAL

Su hijo(a) has sido invitado(a) a participar en un proyecto de investigación conducido por La Universidad de Texas en El Paso. La Universidad requiere que dé su acuerdo firmado dándole permiso a su hijo(a) de participar en este proyecto. La información que sigue se le proporciona para ayudarle tomar una decisión informada acerca de si puede ó no puede participar su hijo(a).

El propósito de este proyecto es de evaluar el programa "Polar's Borderland Heartbeats for Healthy Living" (PBHHL), un programa piloto en El Distrito Escolar Independiente de El Paso que está financiado por la dádiva "NASPE/Polar Heart Rate Monitor Grant". Como el proyecto está estructurado alrededor de clases de educación física que ya existen, las intervenciones identificadas en PBHHL serán asignadas al azar a cada una de las cuatro clases. Las cuatro intervenciones serán: (a) Grupo Tradicional Que Ya Existe; (b) Grupo Aeróbico; (c) Grupo de Entrenamiento de Resistencia; (d) Grupo Combinado.

Al grupo tradicional que ya existe, se le enseñará utilizando el programa actual en la escuela secundaria Guillen. Se utilizarán una variedad de actividades aeróbicas con el grupo aeróbico. Éstas incluyen varias formas de caminar, "jogging", entrenamiento interval, "Tae Bo" y varios bailes latinos, de "Hip Hop" y Salsa. El grupo de entrenamiento de resistencia participará en entrenamiento que incluye pesas, ejercicios con pesas para el cuerpo y pelotas especiales. El grupo combinación participará en una combinación de actividades aeróbicas y de entrenamiento con pesas. Éstas incluyen actividades de entrenamiento circuito y de ejercicios y actividades de condicionamiento y con pesas.

Su hijo(a) participará en el estudio durante su clase de educación física. Se le dará una prueba de aptitud física y un cuestionario de actividad física antes y después del estudio. Todas las clases se llevarán a cabo en el gimnasio grande. Los participantes se pondrán un monitor del ritmo del corazón durante la clase. Harán las actividades que corresponden al grupo al que han sido asignados. El estudio será de 10 semanas con una orientación de 4 semana dónde se les explicará que estarán haciendo.

Los riesgos asociados con este estudio son mínimos. Su hijo(a) puede sentir dolor ó tiesura muscular, falta de aliento y/ó cansancio general. Si su hijo(a) no quiere participar en el estudio, no será castigado(a). Si su hijo(a) decide que ya no quiere seguir con el estudio, puede dejar de participar a cualquier tiempo sin tener problemas. Si su hijo(a) tiene una condición médica y siente que su participación en el estudio puede causarle daño físico, favor de informarnos.

Los beneficios de participar en el estudio incluyen:

- ser apto
- mejores habilidades de motor
- conocimiento de cómo vivir más saludable
- sentirse mejor de si mismo
- más confianza.

Entiendo que se le está pidiendo a mi hijo(a) que participe en este estudio y que puede decidir dejar de participar a cualquier tiempo. Se me ha dado la oportunidad de hacer preguntas acerca de este estudio. Entiendo que, si deseo, puedo hablar con cualquier miembro del grupo de investigación.

Entiendo que se hará todo esfuerzo para mantener los datos de mi hijo(a) confidenciales. Se utilizará un número código para cada participante al empezar el estudio. Ningún nombre de los participantes ni de las escuelas se utilizarán en las publicaciones. Las respuestas orales y por escrito de mi hijo(a) no se distribuirán.

Si tiene preguntas ó desea más información, puede hacerlas ahorita ó comunicarse con Chris Estrada al 915-329-5092, con el Dr. Rockie Pederson (UTEP) al 915-747-7258 ó con Don Disney (EPISD) al 915-881-2337. Este proyecto ha sido analizado por el "Institutional Review Board" de La Universidad de Texas en El Paso. Si tiene preguntas acerca de sus experiencias con este estudio, puede comunicarse con Lola Norton al 915-747-8841 ó por correo electrónico a irb.orsp@utep.edu.

Tengo total conocimiento de las expectativas de mi hijo(a) en este proyecto.
Sé de los posibles riesgos que pueden resultar.
Estoy de acuerdo y doy permiso que mi hijo(a) participe en este proyecto.
He recibido una copia de esta forma.

_____ _____
(Firma de uno de los padres/tutor legal) (Fecha)

_____
(Nombre del padre/tutor legal en letra de molde)

_____
(Nombre del estudiante participante en letra de molde)

_____ _____
(Firma del investigador) (Fecha)

_____ _____
(Firma del maestro(a)/consultor(a)) (Fecha)

PARTICIPANT
ASSENT DOCUMENT

I am being asked to decide if I want to be in this research study because I am a seventh grade student in Physical Education (PE) class at Guillen Middle School.

All PE classes will be held in the big gym. There will be four groups. Each group will be doing something different and fun. You will be doing the activities that are based on your group. The study will be 10 weeks long. A 4 week orientation will be given to you to let you know exactly what you will be doing.

I know that to be in the study I will:

- Take a fitness test at the beginning of the school year
- Take part in specific activities taught in class
- Need to participate for the whole class period
- Wear a heart rate monitor in PE class
- Fill out a physical activity questionnaire in PE class
- Take a fitness test at the end of the year

The risks that come with this study are small. If you have a medical problem that will not let you be in the study please share this with the PE coaches. You should not be in the study if you feel that exercise will cause physical risk to your medical condition. You may feel muscle soreness, muscle stiffness, shortness of breath, or being tired more than usual.

I know that I can stop being in the study at anytime without anyone being mad at me. I will not get in trouble if I stop being in the study.

I know that only the people who work on this research study will know my name.

You may ask any questions you have now. If you have questions later, you may call Chris Estrada at 329-5092 or by email at chris.estrada@laspalmaashealth.com. If you have questions or concerns during your participation as a research subject, please call Lola Norton of the Institutional Review Board (IRB) at UTEP at (915-747-8841) or by email at lola@utep.edu

I have read each page of this paper about this study. I want to be in the study at this time. I know that it's up to me if I want to be in this study and I choose to be in this study. I know I can stop being in this study at any time and nothing bad will happen to me. I will get a copy of this consent form now and get information on results of the study later if I wish.

Participant Name: _____ Date: _____
Participant Signature: _____ Date: _____

Consent form explained/witnessed by: _____
Signature

Printed Name: _____ Date: _____

I have explained the research at a level that is understandable by the child and believe that the child understands what is expected during the study.

Signature of Person Obtaining Assent:

_____ Date: _____

DOCUMENTO DE APROBACIÓN DEL PARTICIPANTE

Se me está pidiendo que decida si deseo tomar parte en este estudio de investigación porque soy un estudiante en el séptimo grado en la clase de educación física (PE) en la escuela secundaria Guillen.

Todas las clases de educación fisica (PE) se llevarán a cabo en el gimnasio grande. Habrá cuatro grupos. Cada grupo estará participando en algo diferente y divertido. Estarás haciendo las actividades que corresponden a tu grupo. El estudio será de 10 semanas. Se te dará una orientación de 4 semana para que sepas exactamente lo que estarás haciendo.

Sé que para tomar parte en el estudio:

- Tomaré una prueba de aptitud física al principio del año escolar
- Tomaré parte en las actividades específicas que se enseñarán en clase
- Necesitaré participar durante toda la clase
- Me pondré un monitor del ritmo del corazón en la clase educación física
- Llenaré un cuestionario de actividad física en la clase de educación física
- Tomaré una prueba de aptitud física al final del año escolar

Los riesgos asociados con este estudio son mínimos. Si tienes un problema médico que no te permite participar en el estudio, favor de compartir ésto con los maestros de educación física. No debes participar en el estudio si sientes que el ejercicio causará un riesgo físico a tu condición médica. Es probable que sientas dolor ó tiesura muscular, falta de aliento ó más cansancio que lo que sientes normalmente.

Sé que puedo descontinuar mi participación a cualquier tiempo sin que alguien se enoje conmigo. No tendré problemas si dejo de participar en el estudio.

Sé que solamente las personas que están laborando en este estudio de investigación sabrán mi nombre.

Puedes hacer cualquier pregunta ahorita. Si tienes preguntas después, puedes llamarle a Chris Estrada al 329-5092 ó comunicarte por correo electrónico a chris.estrada@laspalmaashealth.com. Si tienes preguntas ó inquietudes durante tu participación como un participante del estudio, favor de llamarle a Lola Norton del "Institutional Review Board" (IRB) en UTEP al (915-747-8841) ó comunicarte por correo electrónico a lola@utep.edu.

He leído cada página de esta forma acerca del estudio. Ahorita quiero participar en el estudio. Sé que mi participación en este estudio es voluntario y elijo participar en este estudio. Sé que puedo dejar de participar en este estudio a cualquier tiempo y nada malo me pasará. Recibiré ahorita una copia de esta forma de consentimiento y después, si lo deseo, recibiré información acerca de los resultados del estudio.

Nombre del Participante: _____ Fecha: _____

Firma del Participante: _____ Fecha: _____

Forma de consentimiento se explicó y se atestiguó por: _____
Firma

Nombre en letra de molde:_____ Fecha:_____

He explicado la investigación a un nivel que puede entender una criatura y creo que la criatura entiende lo que se espera de él/ella durante el estudio.

Firma de la persona obteniendo la aprobación:_____ Fecha____

APPENDIX D: POLAR HANDOUTS

Classroom Guidelines

- You will do a fitness test at the beginning and at the end of the study
- You will do specific activities taught in class
- You need to participate for the whole class period
- You will need to suit out at for each class period
- You will wear a heart rate monitor in PE class
- You will fill out a physical activity questionnaire at the beginning and at the end of the study
- You will set personal goals throughout the study
- You will listen to your teacher

Student Goals

- You will learn how to monitor your heart rate while exercising
- You will learn how to find your target heart rate zone.
- You will learn the benefits of exercise
- You will try to improve on your FITNESSGRAM scores
- You will give your best effort in class each class period
- You will understand the importance of technology in PE
- You will have fun

Heart Rate

What is your heart rate?

- Your heart rate is how many times your heart beats in a minute.

Resting heart rate

- Resting Heart Rate = HR at complete rest, best taken right after you wake up

How can we check for heart rate?

- Pulse Counting
- Heart Rate Monitors
    - **They are important because they provide an objective and accurate method for measuring heart rates.**

Checking your heart rate

- The pulse is the easiest way of measuring the heart rate
- Check your heart rate by measuring your pulse.
    - Check pulse on carotid artery and count
    - Use your two middle fingers to find your pulse. Do not use your thumb because your thumb has a pulse of its own.
    - Teacher times for 6 seconds
    - Students multiply by 10
    - This is your Heart Rate

Some people can't measure their pulse or don't want to take their pulse when exercising.

Target Heart Rate

- Is a safety range that lets you exercise
- Allows you to gain the health benefits of exercise
- Let you measure your initial fitness level and watch your growth in a fitness program

How to Find Your Target Heart Rate

Max Heart Rate =220 - age

ex. 220-13= 207 (max heart rate)

- multiply 207 by the percentage of how hard you want to work
- 65% is the low end (need to work at 65% to gain any benefit from working out)
- 85% is the high end (working at a higher percentage puts a lot of stress on the heart and lungs)

207 x **65%**
207 x .65 = **135**
135 is your **low** end

207 x **85%**
207 x .85 = **176**
176 is your **high** end

Your target heart rate is between **135** and **176**.

- A Fast beep on your monitor is telling you;
  A fast beeping sound on your heart rate monitor is letting you know that you are working too hard

- Slow beep on your monitor is telling you;
  A slow beeping sound on your heart rate monitor is letting you know that you are not working hard enough

Applying Your Heart Rate Monitor

The heart rate monitor consists of;

- Watch
- Chest strap
- Transmitter

Applying the heart rate monitor

- Attach watch to wrist
- Wet the electrodes on the transmitter with the spray bottle
- Attach one end of the strap to the transmitter
- Wrap the strap around your back and come up in front attach the other end of the strap to the transmitter
- The transmitter should be in front with the logo "Polar" right below your rib cage.
    - Fit must be snug
    - The transmitter should have constant contact with your skin
    - Females, do not use wire bras because it will interfere with the frequency from your watch

Each of you perform applying the transmitter 10 times

Suiting Out

- You will have 8 minutes from the time the bell rings to dress out for class
- Once you finished dressing out you will report to the big gym
- Once you're in the gym you will have 2 minutes to put on your heart rate monitor and put it on standby
    - Girls will take their watch and strap and go to the storage room and put it on.
- Once your heart rate monitor is on and you have put it on standby you will line up on the baseline on the taped areas (taped areas are placed 5ft away)
- Once everyone is in line the PC coach will come by and check out your watches.
- On the PE coaches count, you will sync your watch and start the warm up

Each of you perform these tasks 10 times

Getting Heart Rate Reading

- Press **Red** button **once.** Once **heart icon** is outlined your E600 is coded to your own pulse rate.
  - You are on **Standby**
  - If not outlined press **blue** button and then press the **red** button again to analyze.
- Press the **Red** button again to start your timer.
  - You are **Synced** and have started your timers
  - Tz – is the time you have been in your target heart rate
  - The timer below Tz shows the time you have been wearing the heart rate monitor
- Press the **Blue** button to stop your time

Each of you practice this 10 times

Issuing of the Heart Rate Monitors

- Each student will be given a strap. You will be responsible for adjusting the size and labeling it with your name.
- The PE coaches will issue you a heart rate monitor with a number.
- You will use that numbered heart rate monitor for the entire PE semester.
- You will put up the heart rate monitor in the heart rate bag and your strap in the linen bag after each class period.

Rules for handling the heart rate monitors

- You will be responsible for the numbered heart rate monitor issued out to you.
- You will be responsible for putting the heart rate monitor back in the case.
- Females should not wear wire bras because it will interfere with the frequency from watch.

Removal and cleaning of the heart rate monitors

- You will remove your strap and transmitter
- Clean off the transmitter and strap with the spray bottles
- Put the strap, transmitter, and watch in correct location for the next student to use

Benefits of Exercise

- Have stronger muscles and bones
- Have a leaner body (helps control body fat)
- Be less likely to become overweight
- Decrease the risk of getting type II diabetes
- Lower blood pressure
- Feel better about life and the way you look and feel

Benefits of Weight Training

- Increased muscle strength
- Increased strength of tendons and ligaments
- May improve flexibility
- Reduced body fat and increase muscle mass (lean body mass)
- Lower blood pressure
- Decrease the risk of getting type II diabetes
- Improve balance

Benefits of Aerobic Fitness

- Improve the function of the lungs and heart
- Lower blood pressure
- Decrease the risk of getting type II diabetes
- Lower cholesterol, increase the good kind
- Have a leaner body (helps control body fat)
- Improve sports performance and motor skills

APPENDIX E: SAMPLE LESSON PLAN FORM

EPISD Physical Education
Lesson Plan Format

<table>
<tr><td colspan="4">Lesson Objectives –Each student will:</td></tr>
<tr><td colspan="4">Fitness:
1) Measure HR and identify the target heart rate zone
Movement:
2) Demonstrate 4 locomotor during station activity
Attitudes:
3) Recognize the benefits of monitoring HR during exercise</td></tr>
<tr><td colspan="4">Physical Education TEKS</td></tr>
<tr><td>6th Grade</td><td colspan="2">7th Grade
7.4A, 7.4B, 7.5D</td><td>8th Grade</td></tr>
<tr><td colspan="3">Learning Activity</td><td>Ongoing Assessment</td></tr>
<tr><td colspan="3">Warm up- consists of dynamic movements such as walking, lunges, butt kicks, high knees, etc. Movements are designed to increase blood flow and heart rate. Warm up is 10 min.

Students will be assigned in rows of 10 and face the screen. Proper instruction will be given by the teacher prior to starting. Aerobic steps will be placed in front of student.

Students will perform activities shown on screen.

First video-aerobic workout. Will do the activity for 10 min. Students will then walk in place until the second video is on. Students will stop and check heart rates every 5 minutes. This will be repeated for each video

Second video- kickboxing

Third video- 4 popular line dance songs. (Cha Cha slide, Electric slide, Cotton Eye Joe, Bunny Hop)

Cool down- walk slowly around the gym for 3 minutes. Begin static stretching for 3 minutes.</td><td></td></tr>
<tr><td colspan="2">Closing</td><td colspan="2">Assessment (lesson objectives)</td></tr>
<tr><td colspan="2"></td><td colspan="2">Recorded heart rate monitor information on daily sheet</td></tr>
<tr><td colspan="2">Materials/Resources
Stop watch, LCD, Lap top, Aerobic steps, videos, heart rate monitors</td><td>TAKS Connections</td><td>Cross Curricular Connections</td></tr>
<tr><td colspan="4">Special/Safety Considerations</td></tr>
<tr><td colspan="4">Students will be reminded the importance of working out safely and cooperatively during the activities. Teacher will be sure that students who have asthma or other medical complications take the necessary precautions prior to starting the lesson.</td></tr>
<tr><td colspan="4">Inclusion/Adaptations</td></tr>
<tr><td colspan="4">Use the appropriate modification from the student’s IEP in order to make modifications in the tasks in order to achieve the same goals.</td></tr>
</table>

CURRICULUM VITA

Christopher Ray Estrada was born in El Paso, TX on March 11, 1977. The son of a single parent Chris leaned on his mother, grandparents and 5 aunts for love and support. Chris graduated from Bel Air High School in May, 1995. While in high school, he was a key player for the Bel Air baseball team earning All-District and All-City honors his senior year and helping the baseball team to a bi-district title. Chris enrolled at El Paso Community College after graduation and was a member of the first El Paso Community College Tejanos baseball team playing for two years. In August, 1997 Chris and seven of his Tejano teammates went to Sul Ross State University and played baseball. In the 1998-1999 baseball season he was a vital member of the pitching staff and helped Sul Ross baseball win the American Southwest Conference title and a top 25 ranking in the Nation for Division-III Universities. In the Fall 1999, Chris worked in the Sul Ross athletic training department and found his calling in the strength and conditioning filed. Chris graduated from Sul Ross with a Bachelors of Science degree in Kinesiology with a Minor in Business Management in May 2000. In 2001 he was hired at Las Palmas LifeCare Center as an Exercise Specialist. Seven years later, Chris is the Manger of the LifeCare Center and responsible for the daily operations of 3 departments. At Las Palmas, he has established a strength and conditioning program for young athletes, established an annual city-wide sports competition for high school athletes, and acquired a Certified Strength and Condition Specialists (CSCS) certification from the NSCA. Chris spends his free time with his wife Christy and their two children, Deuce and Sky. Chris' thesis examined the effects of selected physical activities on maintenance of target heart rate in Hispanic middle school students.

Permanent Address: 12626 Sun Haven

El Paso, TX 79938

This thesis was typed by Chris Estrada.