A DESCRIPTIVE STUDY OF BODY MASS INDEX AND Pedometer-Determined Physical Activity of Guamanian Adolescents

A THESIS SUBMITTED TO THE GRADUATE DIVISION OF THE UNIVERSITY OF HAWAI'I IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

IN

KINESIOLOGY AND LEISURE SCIENCE

DECEMBER 2006

By
Frank D. Calvo Jr.

Thesis Committee:
Charles Morgan, Chairperson
Julie Maeda
Jan Prins
We certify that we have read this thesis and that, in our opinion, it is satisfactory in quality as a thesis for the degree of Master of Science in Kinesiology and Leisure Science.

THESIS COMMITTEE

Chairperson

[Signatures]
ACKNOWLEDGEMENTS

The completion of this thesis paper took assistance and support from many individuals. To Almighty God, for the strength and blessings in life. I would like to thank Dr. Charles Morgan for all his efforts and endless advice in the structuring and outcomes of my thesis work. He has driven me to look abroad and intrinsically motivate myself. I would like to express my sincere appreciation toward committee members Drs. Julienne K. Maeda and Jan Prins for their patience and support throughout this project. I also appreciate Dr. Nathan M. Murata for his endless guidance and support throughout my academic and graduate work.

My deepest “Si Yu’os Ma’ase” to the individuals, administrators, and teachers in Guam who have assisted me in completing my theses project. To Juliet, Swingly, Scott, Misty, Joanie, Mel, Johnmyer, Ed, Lawrence, Arvin, Al, Debra, and Joe, ‘hafa adai yan memorias para todos hamyo’. To my family in Rota, my greatest support and motivation has kept me in the right path, ‘huguaiya-hamyo todos’. Finally, to my wife, you have been my savior and soul mate; I love you.
ABSTRACT

The purpose of the study is to examine physical activity and Body Mass Index (BMI) in Guamanian adolescents. Methods: A total of 192 adolescents, (105 Chamorro, 45 Filipino, & 42 Other) ethnicity in grades 6-8 wore sealed pedometers for 8 consecutive days. Height and weight measures was used to measure BMI. Results: Boys (8537 ± 2698) accumulated approximately 1,200 (14%) more than girls (7369 ± 2343)(p<.01). No ethnic and grade main effect found in PA. Results indicated overweight status by sex. There were no significant differences found in BMI sex, grade, and ethnicity. Interaction (p < .01) main effect for boys normal weight group (9018 ± 2930) accumulated approximately 1,100 (12%) more steps/day than at-risk/overweight BMI group. In contrast, girls at-risk/overweight group (7826 ± 2617) accumulated approximately 700 (9%) more steps per day than normal weight group. Conclusion: Guamanian adolescents accumulated approximately 2,000-5,000 steps/day than the U.S. counterparts. The overweight prevalence of Guamanian adolescents (25%) was higher than the national average (15%). Further, interventions are needed to reduce the prevalence of overweight in Guamanian adolescents.
# Table of Contents

Acknowledgement ........................................................................ iii  
Abstract ................................................................................ iv  
List of Tables ............................................................................ v  
List of Figures ............................................................................ vi  
Introduction ................................................................................ 1  
Methods ....................................................................................... 2  
  Instruments .............................................................................. 3  
  Procedures ............................................................................... 3  
  Statistical Analysis ..................................................................... 5  
Results ........................................................................................ 6  
Discussion .................................................................................... 7  
Reference .................................................................................... 16  

Appendix A: Literature Review  
Appendix B: IRB Certification Form and Memorandum  
Appendix C: FBLG Middle School Collaboration Letter  
Appendix D: Guam Public School System Letter of Certification / Memorandum  
Appendix E: Parent Consent Form  
Appendix F: Child Assent Form  
Appendix G: Parent / Guardian Reminder Letter  
Appendix H: Daily Questionnaire
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Steps/day by sex, ethnicity, and grade</td>
<td>11</td>
</tr>
<tr>
<td>2. BMI group interaction</td>
<td>12</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BMI Group mean steps/day</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>US and Guam Boys mean steps/day (grade 6-8)</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>US and Guam Girls mean steps/day (grade 6-8)</td>
<td>15</td>
</tr>
</tbody>
</table>
Introduction

Disparities exist between physical activity (PA) and overweight among ethnic youth in the United States [1, 2] and because of these disparities, many groups have a higher prevalence of sedentary related diseases [3, 4]. The overweight prevalence in children and young adolescents has increased 5% from the previous report by the National Health and Nutrition Examination Survey[5]. Families that have lower income are less active and have higher body composition[6]. The U. S. Department of Health and Human Services (USDHHS) has identified the elimination of health disparities among all population as one of the two overreaching goals for the nation.

Disparities in overweight and obesity prevalence exist in many segments of the population and include race and ethnicity, gender, age, and socioeconomic status [5-7]. Recent studies have reported Mexican American boys to have a higher prevalence of overweight than non-Hispanic black and non-Hispanic white boys. Non-Hispanic black girls have a higher prevalence of overweight compared to non-Hispanic white and Mexican American girls[8]. The National Heart, Lung, and Blood Institute Growth and Health Study on overweight in children found a higher mean body mass index (BMI) for black girls aged 9 and 10 years, compared to white girls of the same ages[9]. This racial difference in BMI widened and was even greater at age 19[10].

 Minority ethnic groups not only report higher levels of inactivity but also report lower levels of physical activity and these trends are exaggerated for females [11, 12] and low-active adolescent girls [13]. To our knowledge only one study has examined physical activity and overweight in Guamanian adolescents [14]. The authors used data from Youth Risk Behavior Surveillance (YRBS) survey and found that approximately 27 % of
middle and high school students were overweight. This was 41% higher than the prevalence of overweight for white adolescents 16% [2]. The authors also reported that Guamanian adolescents reported 30% less moderate PA and 31% less vigorous physical activity than US adolescents.

There is little evidence on the prevalence of overweight and physical activity in Guamanian adolescents and what is available is outdated and self-reported[14]. Therefore, the primary purposes of this study was to provide a more accurate description of physical activity and overweight by using an objective measure of physical activity and directly measured height and weight values to determine body mass index. A secondary purpose was to ascertain the relationship between overweight status and physical activity. The information derived in this study may be used by interventionists and practitioners to promote physical activity and decrease overweight in Guamanian adolescent.

Methods

Participants Approximately 240 youths in grades 6-8 were solicited to volunteer for the study during one scheduled homeroom class from a public accredited middle school. The school was located in a rural area on the island of Guam in Micronesia and had an enrollment of approximately 1,600 students. Parent consent and student assent forms were returned from 196 of 240 (82%) students. Complete data were collected on 192 (98 girls, 94 boys) of 196 (98%) students. Two participants were forced to withdraw from the study due to suspension and others were eliminated for excessive absenteeism ($n = 3$) and not following the protocol ($n = 1$). Guamanians are referred to as Chamorro and comprised 105 (54%) of the sample. The remainder of ethnic distribution consisted of 45
MISSING PAGE NO.

314

AT THE TIME OF MICROFILMING
scale (Model Seca 884, Hamburg, Germany) was used to measure weight to the nearest tenth kilogram. All measurements were conducted in a private office with a male and a female research assistant. Participants were instructed to remove footwear before height and weight measurements were recorded.

**Statistical analysis.** Data were analyzed using SPSS, version 13.0 for Windows (SPSS Inc., Chicago, IL). Mean steps/day were calculated on 192 participants with 8 days of pedometer data. BMI was calculated by dividing a person’s weight in kilograms by height in meters squared (kg/m²). A pair of analysis of variance (ANOVA) procedures were conducted to determine group differences on mean steps/day and BMI respectively. The between subjects factors included sex, grade (6, 7, 8), and ethnicity (Chamorro, Filipino, Other). For statistical purposes, the sample was divided into three ethnic categories which included Chamorro (n=105), Filipino (n=45), and Other (n=42). The other group included FSM (n=13), Asian (n=10), Belauan (n=7), Marshallese(n=5), Caucasian (n=5), and Hispanic (n=2). CDC growth charts (height, weight, date of birth, and date measured) were used to determine 85th and 95th percentiles of participants in overweight status. Lean, normal, at-risk, and overweight categories were based on the Center of Disease Control (CDC) BMI-for-age growth charts to obtain a percentile ranking. Subjects between the 85th and 95th percentile were classified as “at-risk” for becoming overweight. Greater than or equal to the 95th percentile were considered overweight [21]. A third ANOVA was used to determine if steps/day differed by sex and overweight status. Two overweight status groups included a lean/healthy weight group and at-risk for overweight/overweight group. A p value ≤ .05 was used to indicate statistical significance.
Results

Mean (standard deviation) steps/day by sex, ethnicity, and grade are presented in Table 1. Significant differences were found between sex, \( F(1,174) = 7.66, p < .01 \), partial \( \eta^2 = .04 \). The boys accumulated approximately 1200 (14%) more steps than girls. No significant differences on mean steps/day between Chamorros, Filipinos, and Others, \( F(2,174) = 1.70, p = .19 \), and grades, \( F(2,174) = .746, p = .48 \). No significant differences were found on sex by grade interaction, \( F(2,174) = .08, p = .92 \), sex by ethnicity interaction, \( F(2,174) = .217, p = .80 \), grade by ethnicity interaction, \( F(4,174) = 1.78, p = .13 \), and sex by grade by ethnicity interaction, \( F(4,174) = 1.11, p = .35 \).

Means (Standard Deviations) for BMI by sex, grade and ethnicity are shown in Table 2. No significant differences were found between the BMI sex main effect, \( F(1,774) = 2.19, p = .14 \), grade, \( F(2,174) = 1.19, p = .30 \), and the ethnic main effect, \( F(2,174) = .30, p = .75 \). No significant differences were found on any of the associated interaction effects. Specifically, the sex by grade interaction, \( F(2,174) = .78, p = .46 \), sex by ethnicity interaction, \( F(2,174) = .40, p = .67 \), grade by ethnicity interaction, \( F(4,174) = 1.90, p = .11 \), and sex by grade by ethnicity interaction, \( F(4,174) = 1.76, p = .14 \) were all non-significant. Approximately 4% of the participants were categorized as lean, 57% as healthy, 19% as at-risk for overweight, and 20% as overweight. Guamanian boys and girls BMI values are 26% and 14% respectively.

A 2 x 2 ANOVA was conducted to evaluate the effects of sex and overweight status (lean/healthy weight, at-risk/overweight) on mean steps/day. The results indicated a significant sex by overweight status interaction, \( F (1,192) = 5.529, p = .02 \), as illustrated in Figure 1. As expected, boys in the healthy group (9,018) accumulated 11% more
steps/day than boys in the at-risk/overweight group (7,941). Unexpectedly, girls in the healthy group (7,147) accumulated 9% less steps/day than girls in the at-risk/overweight group (7,826).

**Discussion**

This was the first study to objectively measure physical activity in Guamanian adolescents. Consistent with self-reported and pedometer studies[22, 24-28], boys accumulated (8,537) approximately 1,200 (14%) more steps/day than girls (7,369). In another study, Flohr et al. (2006) reported that 7th grade boys accumulated approximately 2,000 (16%) more steps/day than girls for two consecutive weeks[26]. Tudor-Locke et al. (2006) reported that 6th grade boys accumulated approximately 4,100 (25%) more steps than girls in the same grade[29]. There were also no significant differences among grades (6-8) which is similar to numerous pedometer studies of junior high aged adolescents [30-33]. Although we found no ethnic differences, a recent study conducted in New Zealand children (5-12 yrs) with similar ethnicities (European, Polynesian, Asian, and Other) found significant ethnic differences in pedometer-determined physical activity [24]. The study reported that Polynesian children averaged 10% more weekday steps/day than European (15,000), Asian (14,100), and Others (14,300) respectively.

This study enabled us to compare pedometer-determined physical activity of Guamanian adolescents with U.S. mainland data for the first time. Figures 2 and 3 compare boys and girls in the current study with a large U.S. sample of adolescents by grade. Interestingly, the large disparity found between U.S. mainland and Guamanian adolescents in the current study is very similar to the disparity found in an earlier study of self-reported physical activity[14]. This study is not similar compared to the studies in the
US[30]. The Guamanian boys and girls accumulated less steps/day than their US counterpart in all grades. Sixth, seventh, and eighth grade boys accumulated approximately 8,500 steps/day which was 2,700 (24%) less steps/day than the US 6-8 grade boys. The girls (grades 6-7) accumulated approximately 7,400 steps/day which was 3,100 (30%) less steps/day than the comparison groups. Sixth grade boys accumulated approximately 9,000 steps/day which was approximately 5,100 (36%) steps/day less than US 6th grade boys. Comparable results found with Guamanian 6th grade girls by which accumulated approximately 7,100 steps/day which is 4,300 (38%) steps/day less than US girls.

There were no significant BMI differences between sex, among grades and ethnicities suggesting that group disparities within Guamanian are not apparent. Approximately 20% of the participants were classified as overweight and 19% as “at-risk” for overweight. Guamanian adolescents were 25% higher than the National Average of 6-19-year-olds at 15% (National Health and Nutrition Examination Survey)[5]. Similar results were reported in 1999 Youth Risk Behavior Survey (YRBS) indicated that 26.9% of Guam’s adolescents were overweight due to physical inactivity and poor nutritional practices. The authors reported that over 30% percent of middle school students watch 3 ± 6 hours of television per day and engage in moderate to vigorous physical activity not more than twice a week[14]. Overweight disparities were different with Guamanian boys and girls. The boys indicated higher overweight values than the girls, 26% and 14% respectively. Health related diseases associated with overweight and obesity has dramatically affected residence in the Pacific Islands (PI). Approximately 3 of 4 Pacific Islander adults have been found to be overweight or obese in several island regions
(American Samoa, Fiji, Guam, FSM, etc)[34, 35]. The results found in this study should not ignore prevalent overweight disparities occurring in children and adolescents.

Another key objective in this study was to determine the relationship between overweight status and mean steps/day. Even though body composition has been consistently related to pedometer-determined steps taken in adults [36-38] and children [39], few have attempted to link specific step cut off points to indicators of body fatness. The boys in the healthy weight category were more active than the boys in the overweight weight category, similar results were found in New Zealand children[24]. The boys (healthy weight) accumulated approximately 9,000 steps/day which was 1,100 (11%) more steps/day than the overweight group. In contrast, girls in the overweight group accumulated approximately 7,800 steps/day which was 700 (10%) more steps/day than girls in healthy weight.

**Conclusion**

This was the first study to objectively measure physical activity in Guamanian adolescents. Consistent with the only study ever conducted on Guamanian youth, we found a large disparity in physical activity between Guamanian and U.S. mainland counterparts. Guamanian adolescents accumulated approximately 3,100 (27%) fewer steps/day than their U.S. counterparts. We also found a large disparity in overweight especially for the boys. In this study, 20% of the participants were overweight, 25% higher than National (15%) average. The boys scored higher BMI values than girls, 26% and 14% respectively. Guamanian boys are 42% higher BMI values than National average.
As indicated in Leon Guerrero's research in 1999, middle school students engage in little to no MVPA per week. As habitual activity and reports continue to grow, accumulation of additional evidence will permit refinement of standardized measurement methods and protocols. This study focused on adolescent physical activity and BMI levels. Factors (environmental, physiological, or biological) that determine overweight and physical activity disparities of Guamanian adolescents' needs to be investigated and appropriate interventions conducted.
Table 1: Mean (Standard Deviation) steps/day by sex, ethnicity, and grade

<table>
<thead>
<tr>
<th>Grade</th>
<th></th>
<th>N</th>
<th>Total</th>
<th></th>
<th>N</th>
<th>Chamorro</th>
<th></th>
<th>N</th>
<th>Filipino</th>
<th></th>
<th>N</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>35</td>
<td>8310 ± 1860</td>
<td>19</td>
<td></td>
<td>8058 ± 1829</td>
<td>11</td>
<td></td>
<td>8540 ± 1819</td>
<td>5</td>
<td></td>
<td>8762 ± 2319</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>38</td>
<td>7607 ± 1910</td>
<td>20</td>
<td></td>
<td>7815 ± 1894</td>
<td>8</td>
<td></td>
<td>6429 ± 1454</td>
<td>10</td>
<td></td>
<td>8134 ± 2036</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>30</td>
<td>8782 ± 3194</td>
<td>16</td>
<td></td>
<td>9166 ± 3527</td>
<td>9</td>
<td></td>
<td>8229 ± 1843</td>
<td>5</td>
<td></td>
<td>8550 ± 4380</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>30</td>
<td>7143 ± 1691</td>
<td>16</td>
<td></td>
<td>6810 ± 1777</td>
<td>7</td>
<td></td>
<td>8178 ± 1615</td>
<td>7</td>
<td></td>
<td>6870 ± 1303</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>29</td>
<td>8557 ± 3045</td>
<td>17</td>
<td></td>
<td>9580 ± 3312</td>
<td>5</td>
<td></td>
<td>7170 ± 2048</td>
<td>7</td>
<td></td>
<td>7063 ± 2013</td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>30</td>
<td>7291 ± 3273</td>
<td>17</td>
<td></td>
<td>7882 ± 4029</td>
<td>5</td>
<td></td>
<td>5917 ± 1381</td>
<td>8</td>
<td></td>
<td>6895 ± 1954</td>
<td></td>
</tr>
</tbody>
</table>
Table 2: BMI by sex, ethnicity, and grade (mean ± SD)

<table>
<thead>
<tr>
<th>Grade</th>
<th>N</th>
<th>Total</th>
<th>Chamorro</th>
<th>N</th>
<th>Filipino</th>
<th>N</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>35</td>
<td>22.5 ± 5.3</td>
<td>19</td>
<td>22.7 ± 5.6</td>
<td>11</td>
<td>22.4 ± 5.5</td>
<td>5</td>
</tr>
<tr>
<td>Girls</td>
<td>38</td>
<td>22.3 ± 4.5</td>
<td>20</td>
<td>22.7 ± 4.8</td>
<td>8</td>
<td>23.7 ± 4.1</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>30</td>
<td>22.4 ± 5.3</td>
<td>16</td>
<td>21.4 ± 5.0</td>
<td>9</td>
<td>25.9 ± 18.3</td>
<td>5</td>
</tr>
<tr>
<td>Girls</td>
<td>30</td>
<td>20.3 ± 4.0</td>
<td>16</td>
<td>21.3 ± 4.7</td>
<td>7</td>
<td>18.3 ± 1.1</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>29</td>
<td>22.6 ± 5.4</td>
<td>17</td>
<td>21.7 ± 4.8</td>
<td>5</td>
<td>22.0 ± 5.7</td>
<td>7</td>
</tr>
<tr>
<td>Girls</td>
<td>30</td>
<td>21.5 ± 5.2</td>
<td>17</td>
<td>20.3 ± 4.8</td>
<td>5</td>
<td>22.0 ± 2.6</td>
<td>8</td>
</tr>
</tbody>
</table>
Figure 1: BMI Group (sex by BMI group) mean steps/day
Figure 2: US and Guam boys mean steps-day (sex and grades 6-8)
Figure 3: US and Guam girls mean steps/day (sex and grades 6-8)
Reference


Appendix A

Literature Review
Overweight Disparity: The prevalence of overweight among children and adolescents in the United States has increased significantly over the past 30 years. Professionals and researchers endorse the promotion of physical activity and the prevention of overweight and obesity in youth are important health goals because physical inactivity, and overweight and obesity are two of the most prevalent risk factors for chronic diseases [40]. Records from the National Health and Nutrition Examination Surveys (NHANES) show that, among children age 6 through 11, the incidence of overweight population nearly tripled from 4 percent during 1963-65 to 11 percent during 1988-94 [8]. Reports have showed that in 1999 through 2002, approximately 16 percent of children and adolescents were overweight [5]. The prevalence of overweight among adolescents varies by race and ethnical background. These substantial increases in obesity are not restricted to young Americans; similar patterns have been observed in other countries, including Guam [14], Australia [41], France [29], Norway [42], United Kingdom [43], and New Zealand [24]. In 1999 through 2002, 14 percent of non-Hispanic white adolescents, 21 percent of non-Hispanic black adolescents, and 23 percent of Mexican-origin adolescents were overweight (Centers of Disease Control and Prevention, 1998).

Overweight and obesity among all age groups is an important public health concern. Overweight is determined by comparing weight to height and may be the result of greater lean body mass or body fat; obesity, however, specifically refers to excess body fat. As we age into adulthood, obesity increases the risks of cardiovascular and gallbladder disease, diabetes mellitus, high cholesterol, and certain types of cancer [44]. The primary risk for overweight children is the increased likelihood of overweight and obesity later in life, and consequent increased risk of adult morbidity. Significant
occurrence of overweight-associated illness in children and adolescents is low, although recent research shows that 60 percent of overweight 5-to-10-year old children have at least one risk factor for heart disease [45]. American Academy of Pediatrics (2006) reports disparities to health risks, overweight children suffer social and psychological consequences: “diminished self-esteem, isolation by peers, decreased physical activity and exercise tolerance”.

Physical Activity: Physical activity levels are dramatically declining among young people in countries around the world, especially in poor urban areas. It is probable that the decreasing numbers of physical activity, less than one-third of young people are sufficiently active to benefit their present and future health and well-being. Physical education, community organizations, and other school-based physical activities are also decreasing. Hardly any country offer at least two hours per week of physical education in both primary and secondary schools. These negative trends are likely to continue, even worsen and increase to other countries.

Nearly half of American youths 12–21 years of age are not vigorously active on a regular basis[46]. Moreover, physical activity declines dramatically during adolescence. Overall, White students, 31%, were less likely than Hispanic, 48%, or African American students, 69%, to watch television three or more hours per school day. Physical activity of early half of American youth ages 12-21 years are not vigorously active on a regular basis. Physical inactivity is more common in girls (14%) than boys (7%) and in African American girls (21%) than white girls (12%). Participation in all types of physical activity declines dramatically as age or grade in school increases.
The decrease of physical inactivity is largely due to increasingly common sedentary ways of life and unexpected habits. Fewer children migrate to schools by bicycling or walking and excessive time is committed to watching television, playing computer games, and using computers—seldom at the expense of time and opportunities for physical activity and sports (World Health Organization, 2006).

Determinants of physical activity / inactivity differ between two factors, environmental or biological factors (ethnicities, country of origin, residential location, socioeconomic status, religion, etc.) that may greatly affect one’s engagement in physical activity. Many factors affect children and adolescent involvement in regular physical activity: lack of time and motivation, insufficient support and guidance from adults, self-esteem and confidence, lack of safe facilities and locales for physical activity, little to no information on activities offered in community organizations, and simple ignorance of the benefits of physical activity (WHO, 2006).

Environmental factors are suggested to play a major role in physical activity and other obesity-related behaviors. Geographic and social distribution of recreational facilities was assessed to investigate how inequality in access to recreational facilities might underlie population-level physical activity and overweight patterns. Reports show that higher socioeconomic groups have access to had one or more facilities in their area. Majority of low socioeconomic and minority groups were less likely to have facilities that will provide basic physical activity necessities. Researchers concluded that inequality in availability of physical activity and recreational facilities may contribute to ethnic and socioeconomic disparities in physical activity and overweight patterns [1].
Few studies investigated the determinants of physical activity among African American children have been studied with regard to the psychological, environmental, and sociocultural influences [27, 47, 48].

Understanding how activity levels and body composition of children relate to a healthy lifestyle is a growing area of research. There is much concern about the rapid increase in the percentage of overweight and obese children found in many countries [28]. Current objective measures on pedometry, accelerometry, body composition, and heart rate (HR) telemetry have been consistently utilized to examine and investigate physical activity levels of children, adolescents, and adults in all countries. These objective measures provide data on what needs to be addressed on disparities in eliminating chronic disorders.

In 2003, the Youth Risk Behavior Surveillance System (YRBSS) reported that 33.4% of adolescents did not participate in sufficient physical activity [49]. 14% of youth reported no recent physical activity [33]. In 1999, 13% of children aged 6 to 11 years and 14% of adolescents aged 12 to 19 years in the United States were overweight. Risk factors for heart disease, such as high cholesterol and high blood pressure, occur with increased frequency in overweight children and adolescents compared to children with a healthy weight[50]. Energy expenditure using motion sensors [18].

Pedometer procedures test consistent with published guidelines[21]. The procedures for the distribution and the collection of pedometers provide consistency and efficiency of pedometer-determined physical activity in youth[21]. This procedure continued for eight consecutive days (Monday through Thursday) for two weeks [17].
Factors: Another factor that may impact activity levels is the amount of time sitting and waiting compared to the time given in physical education classes and activities offered during lunch and recess periods. United States schools standards according to NASPE, requires 390 minutes of daily instructional time and 60 minutes of physical education per week. Swedish and Australian schools offer 285-300 and 75-100 minutes of daily instruction/free time with 80 (Sweden) and 30 (Australia) minutes of physical education per week [28]. Guam middle schools provide limited sport-clubs on quarterly basis. Boys and Girls team sports (basketball, volleyball, soccer, softball, and baseball) are offered but are limited to certain participants. Finally, 35% of children walk or bike to school in Guam, 80% of Guam’s highways and streets do not provide sidewalk accessibility.
Appendix B

IRB Certification Form and Memorandum
**Protection of Human Subjects**

**Assurance Identification/IRB Certification/Declaration of Exemption** (Common Rule)

Policy: Research activities involving human subjects may not be conducted or supported by the Department and Agency adopting the Common Rule (SEP 28, 1991) unless the activities are exempt from or approved in accordance with the Common Rule. See section 101(b) of the Common Rule for exemptions. Institutions submitting applications or proposals for support must submit a certification of appropriate Institutional Review Board (IRB) review and approval to the Department or Agency in accordance with the Common Rule.

<table>
<thead>
<tr>
<th>1. Request Type</th>
<th>2. Type of Mechanism</th>
<th>3. Name of Federal Department or Agency and, if known, Application or Proposal Identification No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[X] ORIGINAL</td>
<td>[ ] CONTINUATION</td>
<td></td>
</tr>
<tr>
<td>[ ] CONTRACT</td>
<td>[ ] FELLOWSHIP</td>
<td></td>
</tr>
<tr>
<td>[ ] EXEMPTION</td>
<td>[ ] COOPERATIVE AGREEMENT</td>
<td></td>
</tr>
<tr>
<td>[ ] OTHER</td>
<td>[ ] OTHER</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Title of Application or Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;A Descriptive Study of Body Composition and pedometer-Determined Physical Activity of Guamanian Adolescents&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. Name of Principal Investigator, Program Director, Fellow, or Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frank Dela Cruz Caiao, Jr.</td>
</tr>
</tbody>
</table>

6. Assurance Status of this Project (Respond to one of the following)

[X] This Assurance, on file with Department of Health and Human Services, covers this activity:
Assurance Identification No. F-3523, the expiration date September 23, 2008, IRB Registration No. IORG0000169

[X] This Assurance, on file with (agency/dept)______________________________, covers this activity.
Assurance No.__________________, the expiration date__________________, IRB Registration/Identification No.__________________ (If applicable)

[X] No assurance has been filed for this institution. This institution declares that it will provide an Assurance and Certification of IRB review and approval upon request.

[X] Exemption Status: Human subjects are involved, but this activity qualifies for exemption under Section 101(b), paragraph__________.

7. Certification of IRB Review (Respond to one of the following if you have an Assurance on file)

[X] This activity has been reviewed and approved by the IRB in accordance with the Common Rule and any other governing regulations.
by: [ ] Full IRB Review on (date of IRB meeting)_________ or [X] Expedited Review on December 15, 2005
[ ] If less than one year approval, provide expiration date __________.

[X] This activity contains multiple projects, some of which have not been reviewed. The IRB has granted approval on condition that all projects covered by the Common Rule will be reviewed and approved before they are initiated and that appropriate further certification will be submitted.

8. Comments

| CHS #: 14130 |

<table>
<thead>
<tr>
<th>9. The official signing below certifies that the information provided above is correct and that, as required, future reviews will be performed until study closure and certification will be provided.</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Phone No. (with area code) (808) 988-6007</td>
</tr>
<tr>
<td>12. Fax No. (with area code) (808) 639-3934</td>
</tr>
<tr>
<td>13. Email: <a href="mailto:dendla@hawaii.edu">dendla@hawaii.edu</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10. Name and Address of Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Hawaii at Manoa</td>
</tr>
<tr>
<td>2444 Duke Street, Bachman Hall</td>
</tr>
<tr>
<td>Honolulu, HI 96822</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>14. Name of Official</th>
</tr>
</thead>
<tbody>
<tr>
<td>William H. Dendla</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>15. Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance Officer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>16. Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Signature]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>17. Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 16, 2005</td>
</tr>
</tbody>
</table>

**Public reporting burden for this collection of information is estimated to average less than an hour per response. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: OMB Reports Clearance Officer, Room 3650, 1400 Independence Avenue, S.W., Washington, DC 20503. Do not return the completed form to this address.**
MEMORANDUM

December 16, 2005

TO: Frank Dela Cruz Calvo, Jr.
    Principal Investigator
    Kinesiology & Leisure Science

FROM: William H. Dendle
      Executive Secretary

SUBJECT: CHS #14130- “A Descriptive Study of Body Composition and pedometer-Determined Physical Activity of Guamanian Adolescents”

Your project identified above was reviewed by the Chair of the Committee on Human Studies through Expedited Review procedures. The project qualifies for expedited review by CFR 46.110 and 21 CFR 56.110, Category (4) of the DHHS list of expedited review categories.

This project was approved on December 15, 2005 for one year. If in the active development of your project you intend to change the involvement of humans from plans indicated in the materials presented for review, prior approval must be received from the CHS before proceeding. If unanticipated problems arise involving the risks to subjects or others, report must be made promptly to the CHS, either to its Chairperson or to this office. This is required in order that (1) updating of protective measures for humans involved may be accomplished, and (2) prompt report to DHHS and FDA may be made by the University if required.

In accordance with the University policy, you are expected to maintain, as an essential part of your project records, all records pertaining to the involvement of humans in this project, including any summaries of information conveyed, data, complaints, correspondence, and any executed forms. These records must be retained for at least three years from the expiration/termination date of this study.

The CHS approval period for this project will expire on December 15, 2006. If your project continues beyond this date, you must submit a continuation application to the CHS at least four weeks prior to the expiration of this study.

We wish you success in this endeavor and are ready to assist you and your project personnel at any time.

Enclosed is your certification for this project.

Enclosure
Appendix C

FBLG Middle School Collaboration Letter
December 30, 2005

Mr. Frank Dela Cruz Calvo, Jr.
Graduate Student
University of Hawaii

Re: Research Proposal - “A Descriptive Study of Body Composition and Pedometer-Determined Physical Activity of Guamanian Adolescents”

Dear Mr. Calvo:

Thank you for expressing interest in conducting a research within the Guam Public School System. Please be informed that you have been granted approval to conduct the research relative to “A Descriptive Study of Body Composition and Pedometer-Determined Physical Activity of Guamanian Adolescents”.

Due to the Department’s effort to empower schools to make decisions that affect the conduct of teaching and school operations, the school principals have the final say in participating in the research study. You are responsible for contacting the school principals to request approval to conduct your study. Please also ensure that you obtain the appropriate parent permission for each of the students that will be involved in your study.

We also request that your completed paper contain the following statements to the same effect:

“The activity, which is the subject of this report, has been authorized by the Guam Public School System. However, the opinions expressed herein do not necessarily reflect the position of the OPSS, and no official endorsement by the Guam Public School System or the Government of Guam should be inferred. The author accepts full responsibility for the contents of this document.”

Please also note that nowhere in the final report should reference be made to any student or staff or to the schools/divisions where the participants work.

Finally, the Department requires one (1) bound copy of the completed report. Please submit the copy to the Administrator, Research, Planning and Evaluation Division. The Guam Public School System looks forward to the successful completion of your research.

Sincerely yours,

[Signature]

ZENAIDA MANA-NATIVIDAD, Ph.D.
Administrator (Acting)

I agree with the aforementioned conditions for conducting this study.

[Signature]

FRANK DELA CRUZ CALVO, JR.
Date
Appendix D

Guam Public School System Letter of Certification / Memorandum
December 5, 2005

To: Mr. Frank Calvo, Graduate Student
    University of Hawaii-Manoa

From: Erika Cruz, Principal

Subject: Research Study

Aloha and Hafa Adai! Thank you very much for your interest in conducting your research study at our school. As a former graduate student myself, I am always supportive of efforts that help bring new knowledge to our profession, thus helping us better serve the needs of our students.

Please accept this letter as approval at the school level to conduct your study during the month of January. Note that your methods have been reviewed and will suffice.

In preparation for your study, please note the following points:

1. District approval from the Guam Public School System division of Research, Planning and Evaluation needs to be obtained prior to conducting your study and all guidelines specified by them must be followed.
2. Though we are willing to assist in this area, communication with participating teachers and students on matters pertaining to this study will be your responsibility.
3. Correspondence with parents on matters pertaining to this study need to be acknowledged by a school official- participating teachers will suffice.

Once again, thank you very much for your interest in our school. If there is any way that we can further help you, please do not hesitate to contact myself or Mr. Joe Sanchez, assistant principal of curriculum at the above numbers.

Sincerely,

ERIKA CRUZ

Hannah Gutierrez
Assistant Principal

Dexter Fullo
Joseph Sanchez
Assistant Principal
Assistant Principal
Appendix E

Parent Consent Form
Consent To Be a Research Participant

Dear Parent/Guardian,

I am a graduate student under the direction of Dr. Charles Morgan in the Department of Kinesiology and Leisure Science at the University of Hawaii at Manoa. The study involves determining the relationships between activity levels, body composition and self-esteem in children. I am now conducting a study 6, 7, & 8 graders of Vicente SA Benavente (Dededo) middle school children/adolescents to determine how their physical activity, body composition, and self-esteem change over time.

Students will wear a pedometer for eight weekdays (four weekdays one week and four weekdays a second week). A pedometer is a small (matchbox size) device that attaches on the waistband of your child's pants or shorts and measures step counts. Your child's participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, there will be no penalty, it will not affect your child's grade or standing at school in any way.

The study will be conducted during the weeks of January 3-12, 2006. On the days your child participates they will be given a pedometer at school and asked to wear it all day until they go to bed. Please remind your child to take the pedometer off if it will get it wet in any way. The morning please remind them to please put it back on when your child gets dressed and have them wear it to school until it is collected. The pedometers will be sealed closed to ensure proper data collection. Please encourage your child not to open it. Height and weight will be measured privately during this study and a self-esteem survey will be administered to children in sixth through eighth grades. We recognize that children are not as responsible as adults and encourage you to help your child remember to return the pedometer each day they participate. If you are concerned that your child might lose the pedometer or not return it you do not have to participate, remember that participation is voluntary. We would like to be able to get as many pedometers returned back as possible because each pedometer costs $30.

The indirect benefit of your child's participation is a better understanding of youth physical activity levels that will assist physical education teachers in their efforts to promote and measure daily physical activity.

The results of this project may be published in a journal and/or presented at a professional conference. Your child's name or identity will not be revealed. In order to keep this confidential, only a code number will identify your child in this project. Documents that link your child's name with this code number will be kept separate and secured from the completed data forms.

If you have any questions concerning the research study or your child's participation in this study, please call me at 671-632-2115. If you have further questions or concerns about human subject/human rights, please contact committee on Human Studies at this information:

UHM Committee on Human Studies
2540 Maile Way, Room 253
University of Hawaii at Manoa
Honolulu, HI 96822
Phone: (808)956-5007 or (808)539-3955

Sincerely,
Frank D Calvo Jr
Please sign and complete the information on the Child’s First & Last Name (Please print clearly)

Teacher’s name (Classroom – Junior High) ____________________________

Please answer the following questions:

Child’s birthday: _______ / _______ / _______ 
Child’s age: _______ years old

Child’s Gender: Male Female

Child’s Ethnicity:

____ Chamorro
____ FSM (Chuukese, Yapese, Kosraen, or Phohnpeian)
____ Belauan
____ Marshallese
____ African American
____ Hispanic
____ Native American
____ Asian
____ White

____ Other: __________________________________________

Does your child participate in any after school programs or sports? YES NO

If yes, which ones?

____ soccer ______ baseball/softball
____ basketball ______ dance
____ music lessons or performance ______ YMCA/YWCA/Day Care Program
____ Other, please explain __________________________________________

By signing below, you are giving consent for your child to participate in the above study.

____________________ Signature __________________________ Printed Name 
____________________ Date
Appendix F

Child Assent Form
CHILD ASSENT FORM

I have been told that my parents (mom or dad) or guardian/s have given permission (said it's okay) for me to take part in a project about wearing pedometers and height/weight measurement.

I will be asked to fill out a form about how I feel about activity.

I am taking part because I want to. I know that I can stop at any time I want to and it will be okay if I want to stop.

______________________________

Sign Your Name Here

______________________________

Print Your Name Here
Appendix G

Parent/Guardian Reminder Letter
Pedometer Study

Reminder to Parents:

This note is a reminder to parents regarding the Pedometer study your child is participating in. Your child begins participation today and will continue wearing the pedometer for the next four days. Below are important points to remember regarding participation in this study:

1. Encourage your child to wear the pedometer all day until they go to bed. The next morning they should put the pedometer back on and wear it until they get to school.

2. If for any reason the pedometer might get wet (swimming, taking a bath, etc.), please take the pedometer off and put it on again after that activity.

3. The pedometer should be worn on the right side of the waist with the pedometer positioned in line with the right knee and attached to the waistband of pants or shorts.

4. The pedometer will be sealed, please encourage your child to keep it sealed and to just go about their normal activities.

If you have any questions regarding participation in this study please feel free to call Frank D Calvo Jr at 671-632-2115. Thank you for your support and participation in this study.
Appendix H

Daily Questionnaire
Pedometer Questionnaire

1. How did you get to school yesterday? (Circle One)
   - Bus  Car  Walk  Bike  Skateboard  Other

2. How did you get home yesterday? (Circle One)
   - Bus  Car  Walk  Bike  Skateboard  Other

3. Did you participate in physical education yesterday? (Circle)  Yes  No

4. Did you participate in organized sports yesterday? (A sport that had a coach) (Circle)  Yes  No

5. Did you do any of the following activities yesterday: (Check all activities you did yesterday)
   - Play an after school sport
   - Ride your bike
   - Roller blade
   - Swimming
   - Other physical activities – Name the activities

6. Did you take your pedometer off before going to bed last night?  Yes  No

7. Did you put your pedometer on when you got dressed this morning? Yes  No

8. Did you wear the pedometer the entire time? Yes  No

9. Was there any time you took the pedometer off yesterday? Yes  No
   If yes, how long did you have it off?