

## Puerto Rican pre-teenagers' physical and sedentary activities, dietary trends, and stress

Atividades físicas e sedentárias de pré-adolescentes Porto-Riquenhos, tendências alimentares e estresse

Actividad física y sedentarismo, tendencias alimentarias y estrés de los preadolescentes Puertorriqueños

Received: 06/02/2023 | Revised: 06/08/2023 | Accepted: 06/09/2023 | Published: 06/14/2023

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### Abstract

The purpose of this study was to identify and analyze physical activity, sedentary activity, and dietary behaviors of preadolescents in Puerto Rico. A secondary purpose was to examine perceived stress and the weight status of the Puerto Rican preadolescents. Participants were 107 pre-teenagers (ages 6 to 11 years old) attending public elementary schools in Puerto Rico. Using a descriptive cross-sectional survey study design, we collected data on participants' physical activity, sedentary activity, dietary behaviors, and perceived stress. We also measured participants' height and weight, and calculated body mass indices. MINITAB descriptive and inferential statistical tests were used in analyzing the data. Results indicate that, on average, the participants partook in physical activities for less than 10 minutes each day, but regularly participated in sedentary activities. Their food behaviors varied. ANOVA tests revealed they were not significantly different in height and weight as a function of gender ( $F = 0.78, p = .46$ ), but differed significantly in height and weight as a function of age ( $F = 7.02, p < .00$ ) with older children, on average at greater height and weight. On average, the participants' BMI scores fell within the healthy category, but ranged from healthy to overweight. Mostly, the participants had low levels of stress, worry, or nervousness. Instead, they felt supported and loved. In conclusion, more research in kinesiology is needed, whereby investigators explore, interrogate, and analyze health and social inequities associated with physical and sedentary activities, stress events, and food behaviors of preadolescents in Puerto Rico.

**Keywords:** Body mass index; Food behavior; Preadolescents; Descriptive cross-sectional survey.

### Resumo

O objetivo deste estudo foi identificar e analisar a atividade física, a atividade sedentária e os comportamentos alimentares de pré-adolescentes em Porto Rico. Um objetivo secundário foi examinar o estresse percebido e o status de peso dos pré-

adolescentes porto-riquenhos. Os participantes foram 107 pré-adolescentes (de 6 a 11 anos) que frequentavam escolas públicas de ensino fundamental em Porto Rico. Usando um projeto de estudo de pesquisa transversal descritivo, coletamos dados sobre atividade física dos participantes, atividade sedentária, comportamentos alimentares e estresse percebido. Também medimos a altura e o peso dos participantes e calculamos os índices de massa corporal. Testes estatísticos descritivos e inferenciais do MINITAB foram usados na análise dos dados. Os resultados indicam que, em média, os participantes participaram de atividades físicas por menos de 10 minutos por dia, mas participaram regularmente de atividades sedentárias. Seus comportamentos alimentares variaram. Os testes ANOVA revelaram que eles não eram significativamente diferentes em altura e peso em função do gênero ( $F = 0,78, p = 0,46$ ), mas diferiam significativamente em altura e peso em função da idade ( $F = 7,02, p < 0,00$ ) com crianças mais velhas, em média com maior altura e peso. Em média, as pontuações de IMC dos participantes caíram na categoria saudável, mas variaram de saudável a sobrepeso. Principalmente, os participantes tinham baixos níveis de estresse, preocupação ou nervosismo. Em vez disso, eles se sentiram apoiados e amados. Em conclusão, são necessárias mais pesquisas em cinesiologia, por meio das quais os investigadores explorem, questionem e analisem as desigualdades sociais e de saúde associadas a atividades físicas e sedentárias, eventos de estresse e comportamentos alimentares de pré-adolescentes em Porto Rico.

**Palavras-chave:** Índice de massa corporal; Comportamento alimentar; Pré-adolescentes; Pesquisa descritiva transversal.

### Resumen

El propósito de este estudio fue identificar y analizar la actividad física, el sedentarismo y las conductas alimentarias de los preadolescentes en Puerto Rico. Un propósito secundario fue examinar el estrés percibido y el estado de peso de los preadolescentes puertorriqueños. Los participantes fueron 107 preadolescentes (de 6 a 11 años de edad) que asistían a escuelas primarias públicas en Puerto Rico. Utilizando un diseño de estudio de encuesta transversal descriptivo, recopilamos datos sobre la actividad física de los participantes, la actividad sedentaria, los comportamientos dietéticos y el estrés percibido. También medimos la altura y el peso de los participantes y calculamos los índices de masa corporal. Se utilizaron pruebas estadísticas descriptivas e inferenciales MINITAB para analizar los datos. Los resultados indican que, en promedio, los participantes realizaron actividades físicas durante menos de 10 minutos cada día, pero participaron regularmente en actividades sedentarias. Sus comportamientos alimentarios variaron. Las pruebas de ANOVA revelaron que no eran significativamente diferentes en altura y peso en función del sexo ( $F = 0,78, p = 0,46$ ), pero diferían significativamente en altura y peso en función de la edad ( $F = 7,02, p < 0,00$ ) con niños mayores, en promedio a mayor altura y peso. En promedio, los puntajes de IMC de los participantes se ubicaron dentro de la categoría saludable, pero oscilaron entre saludable y con sobrepeso. En su mayoría, los participantes tenían bajos niveles de estrés, preocupación o nerviosismo. En cambio, se sintieron apoyados y amados. En conclusión, se necesita más investigación en kinesiología, mediante la cual los investigadores exploren, interroguen y analicen las inequidades sociales y de salud asociadas con las actividades físicas y sedentarias, los eventos de estrés y los comportamientos alimentarios de los preadolescentes en Puerto Rico.

**Palabras clave:** Índice de masa corporal; Comportamiento alimentario; Preadolescentes; Encuesta transversal descriptiva.

## 1. Introduction

According to the United States Department of Health and Human Services (2018), children (preadolescents) and adolescents can gain substantial health benefits by engaging in moderate- and vigorous-intensity physical activity (i.e., aerobic activity and age-appropriate strengthening activities) for periods of time that equals 60 minutes or more daily. Regular physical activity (PA) in children and adolescents promotes health and fitness. Compared to children and adolescents who are inactive, those who are physically active tend to have higher levels of cardiorespiratory fitness, stronger muscles and bones, and lower body fat (United States Department of Health and Human Services, 2018). Noteworthy, trend data on children and adolescents' PA reveal a steady increase in PA until the age of 13, where rates of PA start to steadily decrease and sedentary behaviors start to steadily increase (Centers for Disease Control and Prevention [CDC], Youth Risk Behavior Surveillance Survey [YRBSS], 2011).

### 1.1 Physical and Sedentary Activity

Physical activity is generally defined as any movement, involving major muscle groups, which contribute to a person's overall daily energy expenditure (Bauman et al., 2006). There is agreement among researchers that PA is beneficial at any age, and the more PA performed the better the protective effects will be (Garber et al., 2009; United States Department of Health and Human Services,

2008). However, there are thresholds to be met concerning benefits to health or states of well-being, fitness, or ability to carry out daily tasks with vigor (Garber et al., 2009). The current PA recommendations, as stated by the American College of Sports Medicine (ACSM), are geared toward fitness attainment by maximizing cardiovascular and muscular capacity along with augmenting flexibility and neuromotor control (Garber et al., 2009). Nevertheless, sedentary individuals may reap health benefits by performing more PA than they currently do, even if it does not meet the minimum recommendation (Pollock et al., 1998).

The term sedentary behavior has become more pronounced in scientific circles over the past decade; yet there is still some discord as to its true definition. As the name implies, sedentary behavior explains those habitual or volitional choices a person makes to perform an action or activity whilst seated. However, researchers have used “sedentary behavior” as a proxy unit of measurement for the lowest quartile of PA (Torres et al., 2009) or physical inactivity (Cervantes & Porretta, 2013). On the other hand, sedentary activities are defined as those activities performed sitting down or lying down (but not asleep), that require little energy expenditure (Marshall et al., 2002). For this study, sedentary behavior was operationally defined as time you spent sitting, to include time spent at school and at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting with friends, reading, or sitting or lying down to watch television. Sedentary behaviors—although necessary in all our lives—affects human physiology. For example, researchers have linked increases in sedentary behavior with increases in obesity (Ogden et al., 2010). Empirical evidence shows that regular moderate- and vigorous-intensity “physical activity for youth with overweight or obesity can improve their body composition by reducing overall levels of body fat as well as abdominal fat” (United States Department of Health and Human Services, 2018, p. 47). In general, regular moderate- and vigorous-intensity physical activity in children and adolescents promotes health and fitness (United States Department of Health and Human Services, 2018).

## **1.2 Physical Activity and Obesity**

Obesity is inversely correlated to PA, thus mitigating the protective effects PA has on cardiovascular disease and all-cause mortality (Crespo et al., 2002; Kruger et al., 2007). However, a report from the United States Department of Health and Human Services (2013) noted a significant increase in the prevalence of obesity (calculated with body mass index or BMI formula) in adults, children, and adolescents in the United States (U.S.). In the U. S., more than 35% of adults are obese (Crespo & Arbesman, 2003; Ogden et al., 2012). While many variables contribute to adulthood overweight (BMI > 25) and obesity (BMI > 30), there are indications that such adult conditions can be predicted by childhood body habitus (Whitaker et al., 1997; Sun Guo et al., 2002). The BMI score has also been shown to be a good measure of body fat in children when age, gender, weight, and height are all a part of the calculations (Centers for Disease Control and Prevention, 2023). Obesity in children under 10 years, according to Whitaker et al. (1997), becomes a strong predictor of adult obesity, regardless of parental body build. Importantly, researchers conclude that raising awareness in children and strengthening their habits to participate in PA might help establish higher prevalence of PA, which results in higher levels of cardiorespiratory fitness, stronger muscles, and lower body fat (United States Department of Health and Human Services, 2018).

## **1.3 Physical Activity and Dietary Behavior Tendencies**

Particularly relevant to the current study, in 2006 through 2008, a team of external evaluators, sponsored by Puerto Rico’s Department of Recreation and Sport, surveyed adults and adolescents about their PA and nutritional behaviors (Hodge et al., 2007, 2008). In the 2007 report, the evaluators noted that of the 719 Puerto Rican adolescents surveyed (age  $M = 14.6$ ), 57% of boys and 50% of girls participated in moderate-intensity PA while 39% of boys and 24% of girls participated in vigorous-intensity PA (Hodge et al., 2007). Conversely, in the 2008 report, evaluators noted that of the 632 Puerto Rican adolescents surveyed (age  $M = 14.2$ ), roughly three

quarters participated in some form of moderate PA during the week, although only 37% of boys and 35% of girls met the recommended 60 minutes of PA per day (Hodge et al., 2008). Of note, their physical activities were more than three times ascribed to leisure-time PA, as compared to physical education class or organized sports (Hodge et al., 2008).

The extant literature base indicates that most dietary and PA patterns emerge and develop early in the childhood years and influence body weight status and health (Nader et al., 2006; Timmons et al., 2012). Still, research is needed in analyzing dietary behaviors as well as physical and sedentary activities of children prior to their teenage years (i.e., preadolescents). To that end, the current study will contribute to the existing body of literature by describing, analyzing, and interpreting the extent to which Puerto Rican preadolescents, ages 7 to 10 years, are physically active and engaged in sedentary activities. We will analyze and interpret their dietary tendencies and stress markers also. Specifically, the purpose of this study was to identify and analyze physical activity, sedentary activity, and dietary behaviors of preadolescents in Puerto Rico. A secondary purpose was to examine stress risk factors and the weight status of these preadolescents. Our objectives were to determine the weight status, physical activity and sedentary activity tendencies, and dietary behavior tendencies of preadolescents in Puerto Rico. We also sought to determine stress risk factors indicated for preadolescents in Puerto Rico.

## **2. Method**

### **2.1 Research Design**

The research design was descriptive with direct administration of surveys (Fraenkel & Wallen, 2000). In cross-sectional research, outcome variables are collected at a single point of time (Thomas et al., 2011). For this study, we sought to identify and analyze PA, sedentary activity, and dietary behaviors of Puerto Rican preadolescents. Moreover, we sought to examine perceived stress and the weight status of the preadolescents. Prior to initiating the study, approval was obtained from Puerto Rico's Department of Education—Pedagogical Investigations Division to conduct the study, and subsequently approval was attained from the lead researcher's Institutional Review Board (IRB).

### **2.2 Participants and Sampling**

Participants chosen for his study were all pre-adolescents living in Puerto Rico. As delimitations imposed by the researchers, children under the age of 6 years were excluded as participants. Researchers agree that children of this age may lack the cognitive development to understand the nature of the questions posed in the survey instruments (Kohl et al, 2000; Sallis et al., 1992). Adolescents over the age of 12 years were also excluded as participants. Research into adolescent PA trends suggest a significant decrease in PA and significant increase in sedentary behavior during their teenage years (CDC YRBSS, 2011). Lastly, recruitment of participants was delimited to the Mayagüez region in western Puerto Rico. Mayagüez is a municipality with a population of over 70,602 residents located in the center of the western coast on the island of Puerto Rico. According to the U.S. Census Bureau (2018), 99.2% of the population in Puerto Rico are people of Hispanic or Latina and Latino origin.

### **2.3 Instrumentation**

Data were gathered using direct administration of a demographic questionnaire and the following survey instruments: (a) *Visual 7-Day Physical Activity Recall Survey* (Vigo-Valentín et al., 2011), (b) *Visual 7-Day Sedentary Activity Recall Survey* (Torres, 2017), (c) a modified *Visual Food Behavior Checklist* (United States Department of Agriculture, 2007; Vigo-Valentín et al., 2011), and (d) *Perceived Stress Scale for Children* (White, 2014). In addition, the research team assessed students' height and weight measures, for

BMI calculations, using a calibrated weighting scale and stadiometer. These measures were collected on-site at four elementary schools in the municipality of Mayagüez, Puerto Rico.

Prior to data collection in Puerto Rico, each of these instruments were translated from the original English version to the participants' first language (Spanish) using a cross-cultural translation technique (Banville et al., 2000).

## 2.4 Cross-Cultural Validation

To ensure internal validity and enhance external validity (generalizability of the sample results), we sought cultural and content validity in developing and administering the surveys and in analyzing the data. Cultural validity means ensuring that the survey instruments are appropriate for the intended population (i.e., age group, culture, ethnicity, geographical location, language, gender) within their own cultural setting (Cohen et al., 2011).

In this study, the survey instruments underwent several steps toward cross-cultural translation into Spanish. In brief, the original English surveys were translated to Spanish by two fluent bilingual speakers, then back translated to English by two different bilingual speakers, to establish cultural validity (Banville et al., 2000; Vigo-Valentín et al., 2014; Vigo-Valentín et al., 2011). To verify content validity, in the current study, the survey instruments were reviewed by experts in anthropometrics and kinesiology as well as a dietitian and a human nutritionist, and a primary care physician-scientist, to make sure the structure and construct effects of the surveys were consistent (Cohen et al., 2011). The surveys were administered to a small group of Puerto Rican preadolescents, to ensure clarity and understandability for the target population. Edits and changes were made as needed (Banville et al., 2000; Vigo-Valentín et al., 2011).

## 2.5 Data Collection

Prior to contacting school principals about the study, approval was secured from Puerto Rico's Department of Education to conduct the study, and IRB approval was attained from the lead researcher's university. Subsequently, school principals were contacted (via phone or e-mail) by the lead co-investigator to invite them to participate. Once the school principals agreed to allow their school to participate in the study, parental consent forms were sent home and returned by the student participants and then later all data were collected on-site at the participating schools. More specifically, the demographic questionnaires and surveys were administered in a controlled area (i.e., classroom) by designated data collectors (i.e., lead co-investigator and key personnel). The designated schools were given previous notice of the data collectors' arrival date and time. Once the data collectors were ready to start, the surveys were explained in Spanish and administered. The students were told about the study in which they were about to participate in and how to appropriately fill in the surveys and pertinent data.

**Demographic variables.** Information about each participant's age, ethnicity, gender/sex, and health-related conditions or disabilities were collected—from the parent(s)—during the parental consent process. No personal descriptive data was included.

**Physical and sedentary activity.** To assess physical activity, a visual 7-day PA recall survey was used. This survey instrument was originally developed and cross-culturally validated for use with Puerto Rican populations (Vigo-Valentín et al., 2014; Vigo-Valentín et al., 2011). The visual 7-day PA recall has pictures of common physical activities performed by children and adolescents in Puerto Rico (e.g., walking, bicycling, running/jogging) to enhance understanding of PA intensity (Vigo-Valentín et al., 2011). The visual 7-day PA recall also asks for duration of physical activities per day (e.g.,  $\leq 29$ , 30 to 59, 60 to 89, 90 to 119, 120 to 149, and  $\geq 150$  minutes) and type of PA (e.g., organized sport, physical education class, or personal PA) to tease out compulsory or volitional forms of PA (Vigo-Valentín et al., 2011).

To assess sedentary activities, a *Visual 7-Day Sedentary Activity Recall* survey originally developed by Torres (2017) for use with children in Puerto Rico was modified for the current study for use with preadolescents in Puerto Rico. This recall survey was used for measuring sedentary behaviors (e.g., watching television/movies, playing on a computer/video games). To enhance understanding of specific sedentary activities, the sedentary activity recall survey has pictures of common sedentary activities performed by children and adolescents such as listening to music (audiobooks, iTunes); schoolwork (homework, studying, reading); computer used for fun (social networks, movies, games); television watching (favorite shows, movies); video game playing (PlayStation, Xbox, Nintendo DS, iPod); and other sitting activities (talking on the phone, texting, reading for fun). The recall survey also asks for duration of sedentary activity per day (e.g., < 30, 30-60, 60-90, 90-120, >120 minutes) and type of sedentary activity (e.g., activities performed at school or related to school or personal leisure time away from school or at home) to tease out compulsory or volitional forms of sedentary behaviors.

**Dietary Assessments.** Participants' dietary intake and patterns were assessed using a modified *Visual Food Behavior Checklist*. Specifically, a food behavior checklist originally designed and cross-culturally validated by Hodge et al. (2007, 2008) for use with populations in Puerto Rico (Vigo-Valentín et al., 2014; Vigo-Valentín et al., 2011) was modified and combined with the U.S. Department of Agriculture's (2007) SNAP-Ed survey. Hodge et al.'s original Food Behavior Checklist (FBC) is a validated food checklist that provides 7-day recall of the previous week (Sunday through Saturday). The original FBC analysis offered 31 food choices and food security items. We reduced the number of items to 21 and combined the FBC with the validated USDA SNAP-Ed survey to assess nutrition knowledge and behaviors as well. The original SNAP-Ed survey asks children four questions about their eating habits and one question about their attitude towards physical activity and eating healthy foods. In the current study, using paper and pencil, and instruction by the data collectors, the participants viewed visual images of foods and beverages, and answered 26 questions on the modified *Visual Food Behavior Checklist* in their preference of either English or Spanish language.

**Perceived Stress Assessment.** Perceived stress was measured via the 14-question *Perceived Stress Scale for Children* (White, 2014), which was translated to Spanish. In populations from "diverse Hispanic/Latino ethnic backgrounds" (Gallo et al., 2014, p. 468) and including Puerto Rican samples (Ortiz et al., 2015), psychological stress has been linked to cardiovascular risk and metabolic syndromes.

**Body Mass Index (BMI).** Each participant's height and weight were used to calculate her or his body mass index (see <https://www.cdc.gov/healthyweight/bmi/calculator.html>). Both height and weight were assessed with the participant barefoot and in light clothing. We used a digital scale for measuring each participant's body weight. Standing height was measured to the nearest 0.1 cm using a portable stadiometer. We used the Frankfort plane for head positioning before height measures were recorded. BMI was calculated, and using age and sex and the CDC growth charts (Kuczmarski et al., 2002), transformed into BMI z-score for analyses. More specifically, in calculating BMI for children and adolescents (17 years or less), "cutoff criteria are based on the gender-specific BMI-for-age growth charts: underweight (BMI values < 5th percentile); healthy weight (BMI values 5th-84th percentiles); overweight (BMI values 85th-94th percentiles); and obesity (BMI values  $\geq$  95th percentile)" (CDC, 2020, p. 1).

### 3. Data Analysis and Results

Data analyses were conducted with MINITAB statistical software (2021). Descriptive statistical analyses were used in analyzing the demographic questionnaire and survey instruments data (i.e., frequencies, means, medians, and standard deviations). Further, General Linear Model Fixed analysis of variance (GLM ANOVA) procedures were conducted on participants' height (feet/inches) and weight (pounds), by gender and age. Next, we present the demographic results and results of our descriptive analyses of the participants' survey responses.

**Demographic Results.** The participants in this study included 107 Puerto Rican preadolescents ( $n = 53$  boys, 49.5%;  $n = 44$  girls, 41.1%; and 10 participants, 9.4% who did not disclose their gender). The age range was 6 to 11 years old with a mean age of 8.7 years of age (Table 1). The sample mean height was 4 feet, 4 inches with a standard deviation (SD) of 4” and ranged from 3’3” to 5’6”. Specifically, on average, boys’ height was 4’ and 4” with a SD of 4” and girls’ average height was also 4’4” with a SD of 3”. Further, the sample mean weight = 90.7 pounds (lbs.) with a SD of 30 lbs. and ranged from 37 to 181.7 lbs. On average, boys’ weight was 92.5 lbs. with a SD of 29 lbs. and girls’ average weight was also 91.1 lbs. with a SD of 32.8 lbs. Moreover, a General Linear Model (GLM) ANOVA test revealed the participants were not statistically significantly different in height and weight as a function of gender ( $F = 0.78, p = .46$ ). Not surprisingly, however, a GLM ANOVA test revealed the participants differed statistically significantly in height and weight as a function of age ( $F = 7.02, p < .00$ ) with older children, on average at greater height and weight. On average, the participants’ BMI fell within the healthy category (i.e., 22). Nonetheless, the BMI scores ranged from healthy (i.e., 18.5 to 24.9) to overweight (25.0 to 29.9). on the one hand, no participant identified with a disability, nor did the parents of the children participants identify any type of health-related conditions for their child. On the other hand, most of the parents of the children participants indicated that their child participated in some type of physical activity such as exercising, playing games, or sports.

**Table 1 - Participant Demographic Data.**

Variable	Mean	SD	Minimum	Median	Maximum
Age	8.7	1.2	6	9	11
Health-Related Conditions	1.8	0.4	0	No	2
Physical Activity Participation	Yes	0.7	0	Yes	2
Height (Feet/Inches)	4’4”	0’4”	3’1”	4’4”	5’6”
Weight (Pounds)	90.7	30.0	37	87.3	181.7

*Note.* 1 = Yes and 2 = No. | *SD* = Standard Deviation. Source: Authors.

**Visual 7-Day Physical Activity Recall Survey.** Using a *Visual 7-Day Physical Activity Recall* survey, participants were asked to recall their physical activity behaviors of the previous week (Sunday through Saturday). Results show that, on average, the students participated in sports-related physical activities such as fútbol, volleyball, and basketball for less than 10-minutes each day of the previous week (Sunday through Saturday). They were most likely to participate in walking or running activities (Table 2). However, whenever they did participate in physical activities it was usually at home on the weekends (Friday, Saturday, and Sunday) or at school during the week—less so in their communities.

**Table 2 - Visual 7-Day Physical Activity Recall Survey,  $n = 107$ .**

Activity	Mean	SD	Min	Max	Q1	Median	Q3
Fútbol	0.56	1.17	0	5	0	0	0.29
Volleyball	0.83	1.49	0	5	0	0	1.29
Basketball	0.79	1.39	0	5	0	0	0.86
Running	1.21	1.57	0	5	0	0	2.29
Bicycling	0.98	1.56	0	5	0	0	1.86
Walking	1.22	1.52	0	5	0	0	2.00
Other	0.73	1.43	0	5	0	0	0.57

*Note.* 1 = Under 10 minutes; 2 = 10 to 29 mins; 3 = 30 to 60 mins; 4 = Over 60 mins; 5 = two or more categories. Max = Maximum; Min = Minimum; Q = Quartile; SD = Standard Deviation. Source: Authors.

**Visual 7-Day Sedentary Activity Recall Survey.** Using our modified *Visual 7-Day Sedentary Recall* survey, participants were asked to recall their sedentary behaviors Sunday through Saturday of the previous week. The students regularly participated in various sedentary activities such as listening to music, reading for school or fun, watching television, playing video games a bit more on the weekend compared to weekdays (Table 3). Further, when they participated in sedentary activities it was mostly at home on the weekends (Saturday and Sunday—on average 10 to 29-minutes) or at school during the week.

**Table 3 - Visual 7-Day Sedentary Activity Recall Survey (Listening to Music,  $n = 107$ ).**

Days	Mean	SD	Min	Q1	Median	Q3	Max
Sunday	2.0	1.8	0	0	2	4	5
Monday	1.4	1.6	0	0	1	3	5
Tuesday	1.4	1.7	0	0	0	2	5
Wednesday	1.4	1.7	0	0	0	3	5
Thursday	1.4	1.7	0	0	0	3	5
Friday	1.6	1.7	0	0	1	3	5
Saturday	1.9	1.7	0	0	2	3	5

*Note.* 1 = Under 10 minutes; 2 = 10 to 29 mins; 3 = 30 to 60 mins; 4 = Over 60 mins; 5 = two or more categories. Max = Maximum; Min = Minimum; Q = Quartile; SD = Standard Deviation. Source: Authors.

The students did schoolwork (e.g., homework, studying, reading) more often during the weekdays compared to weekends; that is, the weekday *medians* indicate 30 to 60 mins (Table 4).



**Table 4 - Visual 7-Day Sedentary Activity Recall Survey (Doing Schoolwork,  $n = 107$ ).**

Day	Mean	SD	Min	Q1	Median	Q3	Max
Sunday	2.0	1.6	0	0	2	3	5
Monday	2.9	1.4	0	2	3	4	5
Tuesday	2.6	1.6	0	2	3	4	5
Wednesday	2.6	1.6	0	2	3	4	5
Thursday	2.6	1.6	0	2	3	4	5
Friday	2.6	1.7	0	1	3	4	5
Saturday	1.5	1.7	0	0	1	3	5

Note. 1 = Under 10 minutes; 2 = 10 to 29 mins; 3 = 30 to 60 mins; 4 = Over 60 mins; 5 = two or more categories. Max = Maximum; Min = Minimum; Q = Quartile; SD = Standard Deviation. Source: Authors.

Further, the students did fun computer activities (e.g., social networking, watching movies) each day (Table 5), on average 10 to 29-minutes or more (e.g., *median* indicates 30 to 60-minutes on Sunday). They tended to watch television (e.g., favorite show, movies) more so on the weekend (*median* score indicates 30 to 60-minutes) compared to weekdays (Table 6).

**Table 5 - Visual 7-Day Sedentary Activity Recall Survey (Fun Computer Activities,  $n = 107$ ).**

Day	Mean	SD	Min	Q1	Median	Q3	Max
Sunday	2.5	1.6	0	1	3	4	5
Monday	1.9	1.8	0	0	2	4	5
Tuesday	1.9	1.8	0	0	2	3	5
Wednesday	1.7	1.7	0	0	2	3	5
Thursday	1.9	1.8	0	0	2	3	5
Friday	1.9	1.7	0	0	2	4	5
Saturday	2.1	1.7	0	0	2	4	5

Note. 1 < Under 10 minutes; 2 = 10 to 29 mins; 3 = 30 to 60 mins; 4 = Over 60 mins; 5 = two or more categories. Max = Maximum; Min = Minimum; Q = Quartile; SD = Standard Deviation. Source for Tables 5 and 6: Authors.

**Table 6 - Visual 7-Day Sedentary Activity Recall Survey (Watch Television,  $n = 107$ ).**

Day	Mean	SD	Min	Q1	Median	Q3	Max
Sunday	2.4	1.7	0	1	3	4	5
Monday	2.0	1.7	0	0	2	3	5
Tuesday	2.0	1.7	0	0	2	3	5
Wednesday	2.0	1.7	0	0	2	3	5
Thursday	1.9	1.7	0	0	2	3	5
Friday	2.1	1.7	0	0	2	4	5
Saturday	2.2	1.7	0	0	3	4	5

*Note.* 1 < Under 10 minutes; 2 = 10 to 29 mins; 3 = 30 to 60 mins; 4 = Over 60 mins; 5 = two or more categories. Max = Maximum; Min = Minimum; Q = Quartile; SD = Standard Deviation. Source for Tables 5 and 6: Authors.

Likewise, the students tended to play video games (e.g., PlayStation, Xbox, Nintendo DS) more on the weekend (*median* indicates 30 to 60-minutes) than weekdays (Table 7). Lastly, they tended to participate in sedentary activities while sitting (e.g., talking on the phone, texting, reading for fun) a bit more on the weekend (*median* indicates 10 to 29-minutes) compared to weekdays (Table 8).

**Table 7 - Visual 7-Day Sedentary Activity Recall Survey (Video Games,  $n = 107$ ).**

Day	Mean	SD	Min	Q1	Median	Q3	Max
Sunday	2.4	1.8	0	0	3	4	5
Monday	1.9	1.7	0	0	2	3	5
Tuesday	1.9	1.8	0	0	2	4	5
Wednesday	1.8	1.8	0	0	1	3	5
Thursday	1.9	1.8	0	0	2	4	5
Friday	1.9	1.8	0	0	2	4	5
Saturday	2.1	1.8	0	0	3	4	5

*Note.* 1 < 10 minutes; 2 = 10 to 29 mins; 3 = 30 to 60 mins; 4 = Over 60 mins; 5 = two or more categories. Max = Maximum; Min = Minimum; Q = Quartile; SD = Standard Deviation. Source for Tables 7 and 8: Authors.

**Table 8** - Visual 7-Day Sedentary Activity Recall Survey (Seated sedentary activities,  $n = 107$ ).

Day	Mean	SD	Min	Q1	Median	Q3	Max
Sunday	1.4	1.6	0	0	1	3	5
Monday	1.3	1.6	0	0	0	2	5
Tuesday	1.2	1.7	0	0	0	2	5
Wednesday	1.1	1.6	0	0	0	2	5
Thursday	1.2	1.7	0	0	0	3	5
Friday	1.2	1.6	0	0	0	3	5
Saturday	1.4	1.7	0	0	1	3	5

*Note.* 1 < 10 minutes; 2 = 10 to 29 mins; 3 = 30 to 60 mins; 4 = Over 60 mins; 5 = two or more categories. Max = Maximum; Min = Minimum; Q = Quartile; SD = Standard Deviation. Source for Tables 7 and 8: Authors.

### Modified Visual Food Behavior Checklist

The modified *7-Day Visual Food Behavior Checklist* was used to assess: (a) whether the participants consumed foods and drinks from various food group categories, (b) the frequency of consumption (*how often*), and (c) regularity (*how many times*) in the previous week.

**Table 9** - Modified Visual Food Behavior Checklist (Yes/No Responses,  $n = 107$ ).

Variable (Sunday through Saturday)	Mean	SD	Median	Interpret Data
Do you eat fruits?	1.1	0.3	1	Yes
Do you eat vegetables?	1.4	0.5	1	Yes
Do you eat fish?	1.6	0.5	2	No
Do you eat chicken?	1.0	0.2	1	Yes
Do you eat eggs?	1.2	0.6	1	Yes
Do you drink soda or pop?	1.2	0.4	1	Yes
Do you drink fruit flavored drinks?	1.1	0.3	1	Yes
Do you drink sports drinks?	1.1	0.3	1	Yes
Do you eat fried foods?	2.0	1.3	2	No
Do you drink milk?	1.2	0.4	1	Yes

*Note.* 1 = Yes and 2 = No. | SD = Standard Deviation. Source: Authors.

Results from the modified *7-Day Visual Food Behavior Checklist* reveal that, on average (Sunday through Saturday), the students regularly ate chicken, fruits, and eggs, and regularly drank fruit-flavored drinks and sports drinks (Tables 9 and 10). In contrast, on average, they seldom to occasionally ate vegetables, fried foods, and fish, or drank milk (Table 11).

**Table 10** - Modified Visual Food Behavior Checklist (How Often Responses,  $n = 107$ ).

Variable	Mean	SD	Q1	Median	Q3	Interpret Data
In the past week, I ate fruit...	2.6	1.4	1	2	4	Regularly
In the past week, I ate vegetables...	1.9	1.3	1	1	3	Seldom
In the past week, I ate fish...	1.6	1.1	1	1	2	Seldom
In the past week, I ate chicken...	2.6	1.2	2	2	3	Regularly
In the past week, I ate eggs...	2.2	1.1	1	2	3	Occasionally
In the past week, I drank soda or pop...	2.5	1.3	1	2	3	Regularly
In the past week, I drank fruit-flavored drinks	2.8	1.4	2	2	4	Regularly
In the past week, I drank sports drinks...	2.8	1.4	2	2	4	Regularly
In the past week, I drank milk...	2.5	1.4	1	2	3	Regularly

*Note.* One = Never; Two = 1-3 days; Three = 4-6 days; Four = About once a day; Five = Two or more times a day. Q = Quartile; SD = Standard Deviation. Source: Authors.

**Table 11** - Modified Visual Food Behavior Checklist ( $n = 107$ ).

In the past week, how many times...	Mean	SD	Median	Interpret Data
Did you eat fruits?	2.8	1.5	2	At least 1 to 2 times or more
Did you eat vegetables?	2.0	1.3	1	On average, 1 to 2 times
Did you eat fish?	1.5	1.0	1	Less than, 1 to 2 times
Did you eat chicken?	2.7	1.3	2	At least 1 to 2 times or more
Did you eat eggs?	2.4	1.3	2	At least 1 to 2 times or more
Did you drink soda?	2.5	1.4	2	At least 1 to 2 times or more
Did you drink flavored or sports drinks?	1.1	0.4	1	Less than, 1 to 2 times
Did you eat fried foods?	2.6	1.2	2	At least 1 to 2 times or more
Did you drink milk?	2.8	1.7	3	At least 1 to 2 times or more

*Note.* One = None; Two = 1-2 times; Three = 3-4 times; Four = 5-6 times; Five = 7 or more | SD = Standard Deviation. Source: Authors.

### Children Perceived Stress Scale

Using the *Children Perceived Stress Scale*, participants were asked to respond to questions prompted with the stem, “In the last week, how often did...” (Table 12). Results from the children perceived stress scale indicate that the participants had or expressed low to modest levels of stress, worry, or nervousness generally—mostly they had low levels. Generally, the participants did not feel rushed or hurried—and typically did not worry about feeling too busy.

**Table 12** - Children Perceived Stress Scale ( $n = 107$ ).

Item	In the last week, how often did you...	Mean	SD	Median	Interpret Data
1	feel rushed or hurried?	2.4	1.1	2	A little
2	had enough time to do what you wanted?	2.8	1.1	3	Sometimes
3	feel worried about being too busy?	1.9	1.1	2	A little
4	feel worried about grades or school?	2.6	1.2	3	Sometimes
5	mom/dad make you feel better?	3.5	1.1	4	Some to a Lot
6	mom/dad make you feel loved?	3.6	0.9	4	Some to a Lot
7	feel scared or nervous?	2.3	1.1	2	A little
8	feel angry?	2.3	1.1	2	A little
9	feel happy?	3.6	0.8	4	Some to a Lot
10	get enough sleep?	3.2	1.0	4	Some to a Lot
11	have fights with your friends?	1.9	1.2	1	Almost never
12	play with your friends?	3.2	1.1	4	Some to a Lot
13	feel that you had enough friends?	3.2	1.0	4	Some to a Lot

*Note.* 1 = Never; 2 = A Little; 3 = Sometimes; and 4 = A Lot. Source: Authors.

Further, the participants only sometimes worried about the grades or school. They almost never had fights with their friends, nor felt feel angry. Instead, they played with and had enough friends. Important also, they felt supported and loved by their parents. These children were mostly happy and felt they got enough sleep at night.

## 4. Discussion

In all, the results in this study reveal several key points related to weight status of preadolescents in Puerto Rico, dietary behavior tendencies, physical and sedentary activity tendencies, and stress risk factors. Next, we discuss the implications of the study's results.

### 4.1 Weight and Dietary Behavior Tendencies

The participants in this study, ages 6-11 years old, had a BMI mean of 22.0 that put them within the healthy category as a group based on height, weight, age, and gender. Individually, however, some of the BMI scores fell in the overweight (25.0 to 29.9) category for the boys and girls in this study. BMI values in this range correlate with the 85th-percentile and higher classifications that are considered overweight (Centers for Disease Control and Prevention, 2023). Being overweight is often tied to dietary behavior tendencies and should be addressed accordingly.

Using a modified visual food behavior checklist, students in this study reported that they regularly ate chicken, fruits, and eggs, and regularly drank fruit-flavored drinks and sports drinks. They also reported that they only *seldom* to *occasionally* ate vegetables, fried foods, and fish, or drank milk. Some of these food choices and dietary tendencies appear to be ideal when eaten in the right proportion and prepared in healthy ways, while others may need a closer examination. For instance, all foods, even healthy ones, must be consumed in the right proportion based on one's size and in some cases their gender. Boys require more caloric intake, on average, than girls and younger children require less food intake than older children (Mayo Clinic, 2023). As a result, it is recommended that both children and

adults measure their portions by the size of their hand (cupped and open) or fist (closed hand) when trying to determine adequacy of food amounts (Daunt & Romeo, 2017). According to the U.S. Department of Agriculture (n.d.), a healthy diet includes fruit (all fruits and 100% fruit juice), vegetables (any vegetable and 100% vegetable juice), proteins (e.g., seafood, meat, poultry, eggs, beans, peas, lentils, nuts, seeds, and soy products), grains (whole and refined) and dairy (milk, yogurt, cheese, lactose-free milk and fortified soy milk and yogurt). In other words, healthy eating involves intentional and informed choices about the five food groups consumed in the right proportions and prepared in the healthiest manners. Regarding sugar intake, the 2020-2025 *Dietary Guidelines for Americans* recommends limiting added sugars to less than 10% of daily calories for those age two and older (U.S. Department of Agriculture, 2020). In the case of this sample, respondents reported regular consumption of fruit-flavored drinks and sports drinks, which are high in sugars.

To ward off future weight and BMI issues in children in Puerto Rico, it is important to stress to children and their families the importance of healthy dietary practices. This includes education on healthy food choices, appropriate food portions, healthy food preparations, as well as balancing caloric intake (energy) based on the amount of energy that is expended. Additionally, total fat intake should not exceed 30% of one's total caloric intake in a day (World Health Organization, 2020) and extra sugar and salt intake should be limited in a child's diet (United States Department of Agriculture, 2020).

#### **4.2 Sedentary and Physical Activity Tendencies**

Sedentary behavior is increasing in people of all ages and is one of the most common risk factors for overweight and obesity biometrics today (Zha et al., 2022). The preadolescents in our study regularly participated in various sedentary activities—all in increased amounts on the weekend and in the home. When they watched television, for instance, they tended to do so more so on the weekend, and when they played video games, they tended to play more on the weekend as well. These sedentary activities often took place while the participants were sitting. All sedentary activities are not the same, however. Su et al. (2023) reports in one study that passive television watching was associated with increased risk of coronary heart disease, while sedentary time on the computer was not. The researchers speculate that the increased risk of coronary heart disease was related to the increased likelihood of snacking and having disordered eating timing while watching television, while computer use requires a concerted effort to navigate.

Paduano et al. (2021) found in their sample of age 6- to 7-year-old boys and girls in Italy that 63.9% of the 376 children in their study spent 2 or more hours per day in sedentary activities, while 76.5% of the sample of 450 children spent less than 7 hours per week in physical activities. In their study on sedentary behaviors and excessive weight among Chinese children, adolescents and adults, Su et al. (2023) found that 63.4% of their sample of children and adolescents reported less than 60 minutes of physical activity per week while 20.8% reported 300 or more minutes in sedentary leisure time per week. It is clear by the findings in Su and colleagues' study, that children and adolescents are spending inordinate amount of time engaging in various forms of sedentary activities and not enough time engaging in physical activities. Even among the preadolescents in this current study, the results show that, on average, that students participated in physical activities such as fútbol, volleyball, and basketball for less than 10-minutes each day of the previous week. This is a grave departure from recommended guidelines. According to the *Physical Activity Guidelines for Americans* (United States Department of Health and Human Services, 2018), physical activity has been shown to be integral to weight management and is recommended for children (ages 6 to 17) for at least 60 minutes per day with components that include aerobic, muscle strengthening, and bone strengthening activities. It is critical that children (preadolescents) and adolescents spend more time engaging in organized or non-organized physical activities while intentionally cutting down on the various forms of sedentary activities that they tend to engage in (e.g., listening to music, watching television, playing video games).

### 4.3 Stress Risk Factors

Results from the *Children Perceived Stress Scale* indicate that the participants had or expressed low to modest levels of stress, worry, or nervousness generally—mostly low levels. They also reported that they felt supported and loved by their parents and had enough friends. Respondents' low to modest levels of stress by the Puerto Rican children in this study may be a sign or reflection of changes, growth, family stability, and progress in the Puerto Rico region since Hurricane María in 2017 (Martínez Rivera & Hodge, 2022) and Hurricane Fiona in 2022. These natural disasters hard hit Puerto Rico and resulted in many deaths, near collapse of the entire economy, a jump in suicides, extended power outages, toxic stress, lack of clean water, widespread concerns about the toll the disasters would have on the mental health of children in the long run, and school closures across the island (Diaz, 2022; Martínez Rivera & Hodge, 2022; Santhanam, 2018). Children and adults, alike, in Puerto Rico in the recent past have had plenty to be *nervous* and *angry* about. These respondents, however, report a very different point in time for the Mayagüez region in western Puerto Rico. This may be the right time to prioritize physical activity once again in schools and throughout local communities.

In all, this study's results and analyses add relevant information to the empirical literature about preadolescents' weight status, physical activity and sedentary activity tendencies, and dietary behavior tendencies, as well as stress risk factors indicators of preadolescents in Puerto Rico. Nonetheless, this study has limitations. First, the data were collected with self-reports, which are commonly used in survey studies due to ease of use, quick administration, ease of cross-study comparisons, and low cost; however, researchers caution that self-reporting of physical or sedentary activities is marred with limitations (Kohl et al., 2000; Pate, 1993; Sallis, 1991). For instance, accuracy of recall may be questioned since it is hard for children (preadolescents) or adolescents to recollect non-habitual or unstructured activities such as playtime (Kohl et al., 2000). Moreover, interpretation of recall may be questioned, since preadolescents may not understand the true differences between low, moderate, and vigorous PA and where their physical activities fall within these categories (Kohl et al., 2000). Self-report may also preclude validity and reliability estimates, since researchers may use survey instruments developed for children or adolescents of rural settings on children or adolescents in urban settings (Kohl et al., 2000). In addition, researchers have found varying levels of inconsistencies when comparing self-reported PA against objective measures of PA, such as accelerometry, pedometry, heart rate telemetry, doubly labelled water, or direct observation (Sallis, 1991; Welk et al., 2000). Finally, the potential for gender bias may increase, since questionnaire items may be interpreted differently by girls and boys, rendering questionnaire gender-inappropriate (Kohl et al., 2000).

A second limitation exists because convenience sampling was used, the results of the study are limited to Latina and Latino preadolescents who attend public schools in that western region of Puerto Rico and cannot be generalized to children (preadolescents) elsewhere in Puerto Rico or in the continental United States.

## 5. Conclusion

There is need for more research in kinesiology, whereby investigators explore, interrogate, and analyze health and social inequities associated with physical and sedentary activities, stress events, and food behaviors of preadolescents in Puerto Rico. According to Lee et al. (2012), multiple levels of social disadvantage (school, family, peer, and neighborhood) are linked to obesity in adolescence as well as adulthood. Childhood weight problems are associated with adult weight problems. Specific to our study, the research shows that young children (preadolescents) and adolescents in Puerto Rico are generally at risk of poor health due to poor dietary habits, being overweight or obese and having low physical activity levels (Rivera-Soto et al., 2010; Vigo-Valentín et al., 2014; Vigo-Valentín et al., 2011). Given the depth and breadth of the complexity around structural disadvantages, overweight and obesity issues, dietary activities, sedentary activities, and the low physical activity levels of children in Puerto Rico, it is important to take a

comprehensive approach to addressing this major public health issue. This would entail schools, neighborhoods, health professionals, social workers, policymakers, and many more all working together to strategically implement best practices around this issue.

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