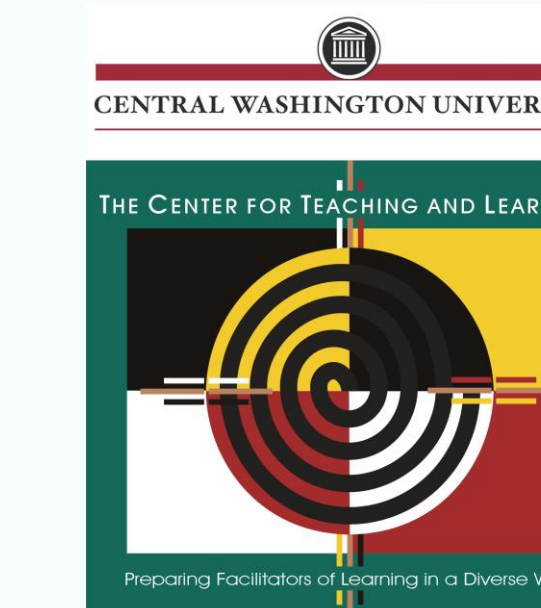




Intensity Levels in Children Ages 7-10 While Traverse Climbing

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Abstract

Introduction / Problem Statement

Childhood obesity continues to be a challenge and appears to be worsening (Ogden & Carroll, 2010). In response there appears to be a trend which is to prescribe an adult version of activity which is less than enticing for kids. Climbing is a lifetime activity that can be carried throughout life but even if not, a greater variety of activities that kids are excited to participate in may have a greater impact that the adult versions of fitness activities. One activity that has experienced an extreme level of growth across the country is traverse climbing. However, interestingly the growth has been in part, driven by assumed gains in strength, flexibility and mental toughness (Mittelstaedt, 1997). The climbing research that exists uses either trained, elite climbers or takes place on a vertical climbing wall. Much of the research has examined simple physiological responses without regard to impact on fitness and have also focused on vertical climbing instead of horizontal climbing. Ridley, Ainsworth and Olds (2008) have created a compendium of children's activities that include specific intensity levels but over 60% of the values were derived from studies using adults. There is little evidence that exists detailing the energy costs of children while climbing and none while climbing horizontally on a traverse wall. Therefore, the purpose of this study was to determine the intensity levels of elementary aged (6-10) children while climbing horizontally.

Methods

Subjects: Fifty-one (males =22, females =24), from one rural elementary school serving a diverse population.
Recruitment: packets sent home with kids that including information concerning study, parent consent form, student consent form, health screening tool. Spanish versions were sent home for families who were Spanish speakers.

Data Collection Procedures:

- Weight
 - ✓ Collected via a stadiometer
- Energy expenditure
 - ✓ Accelerometers
 - ✓ ActiGraph –GT3X
 - worn on the right hip continuously
 - held on subject's waist with a nylon belt
 - ✓ ActiGraph Computerized Software
 - used to determine the intensity of the activity
- Subjects climbed on a traverse climbing wall designed and built by Everlast Industries
 - ✓ continuous climb for 4 minutes
 - ✓ each time the subjects reached the end of the wall, they reversed direction and climbed back the way they had just come



Data Analysis

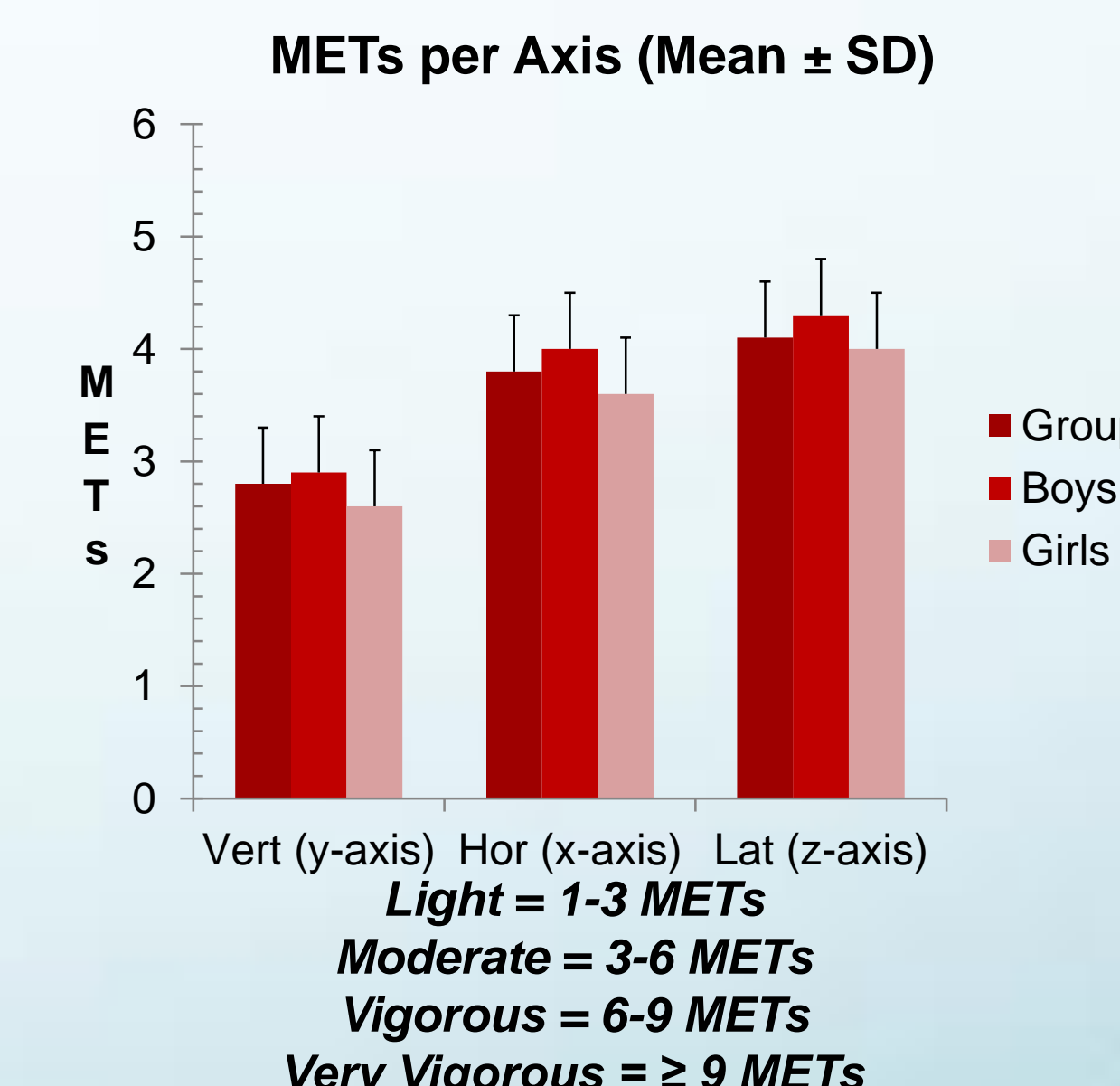
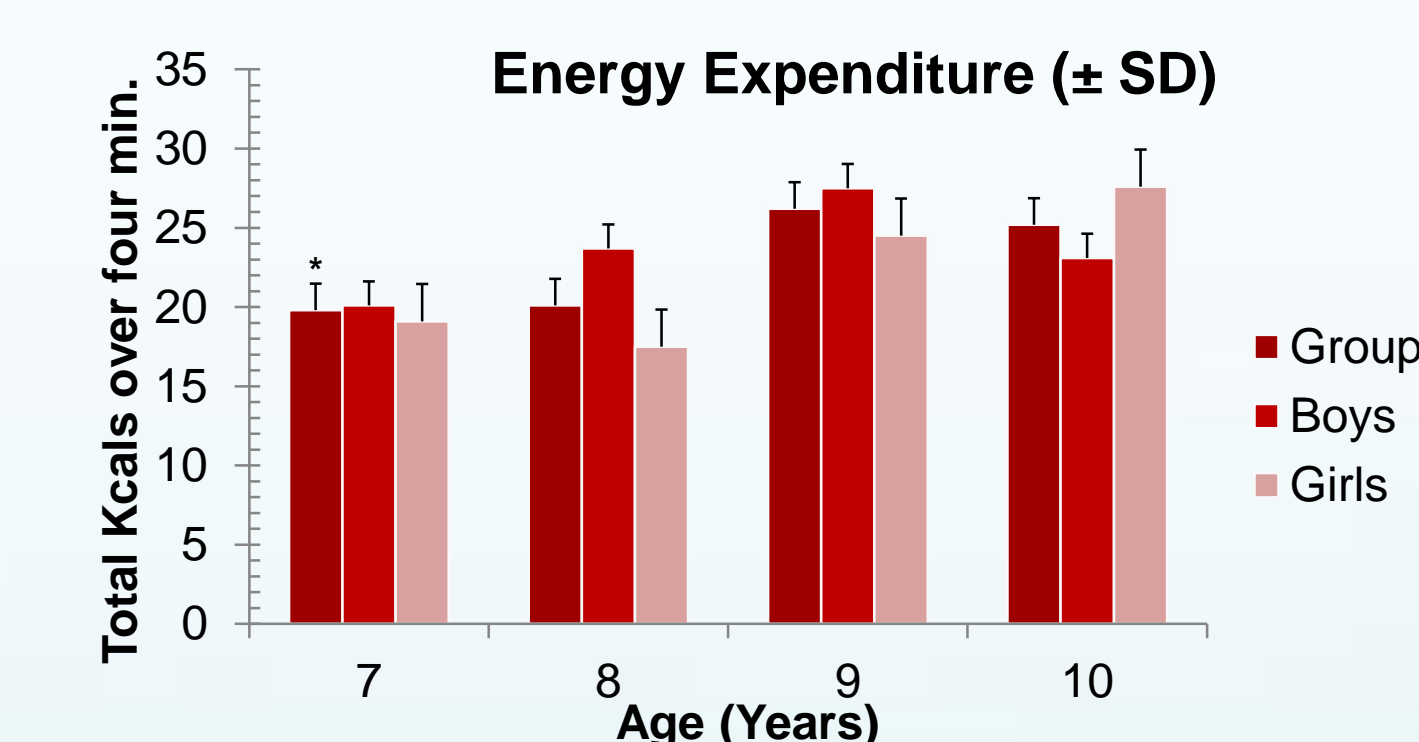
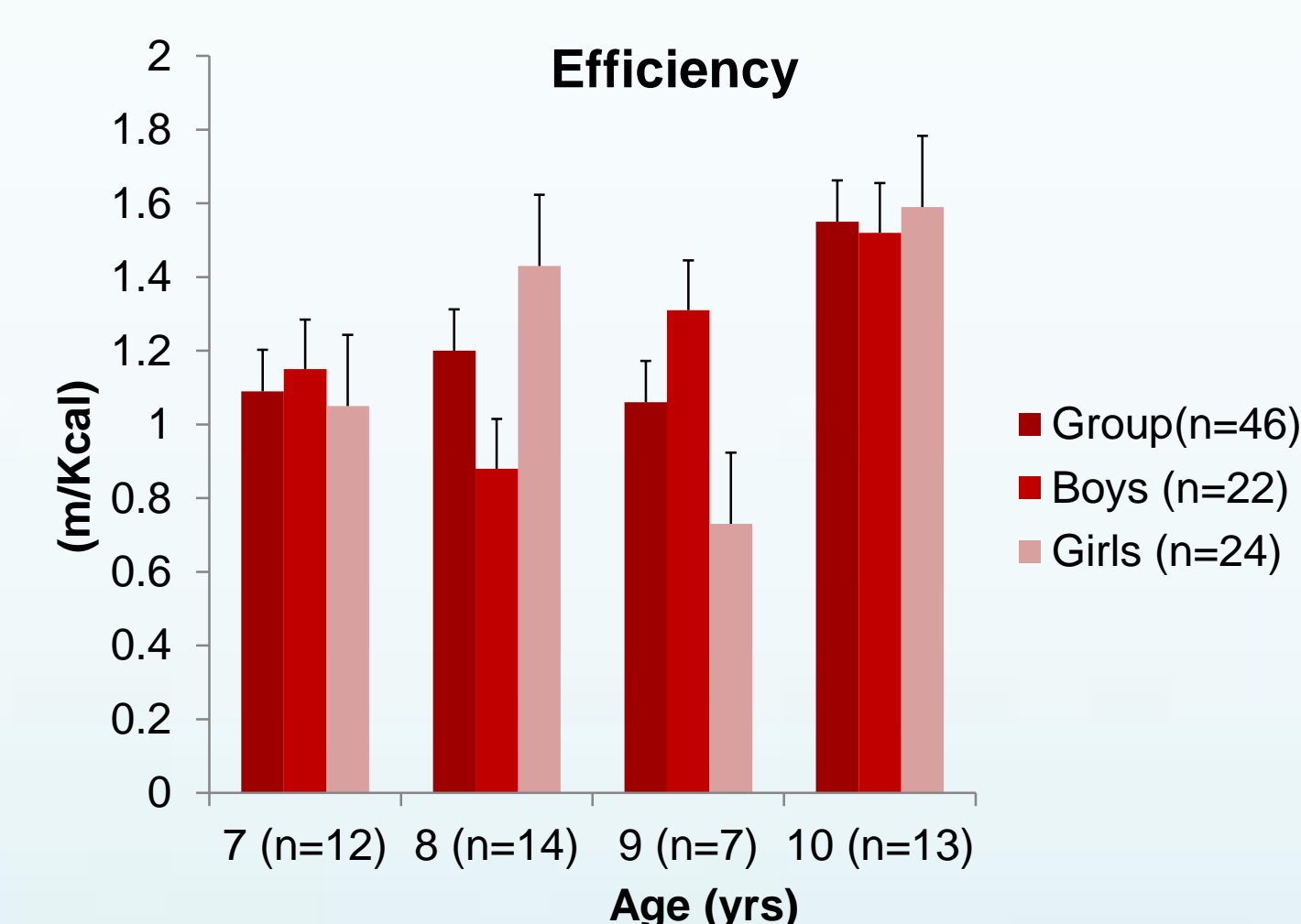
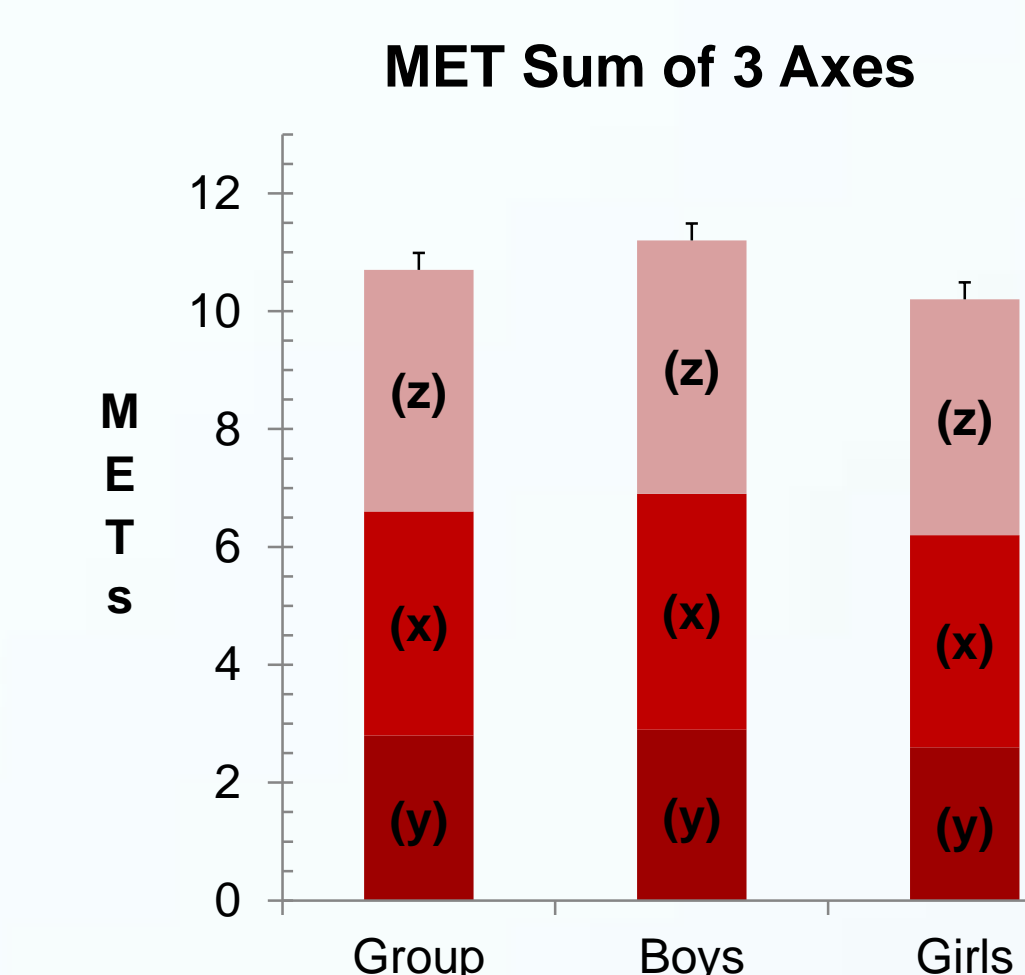
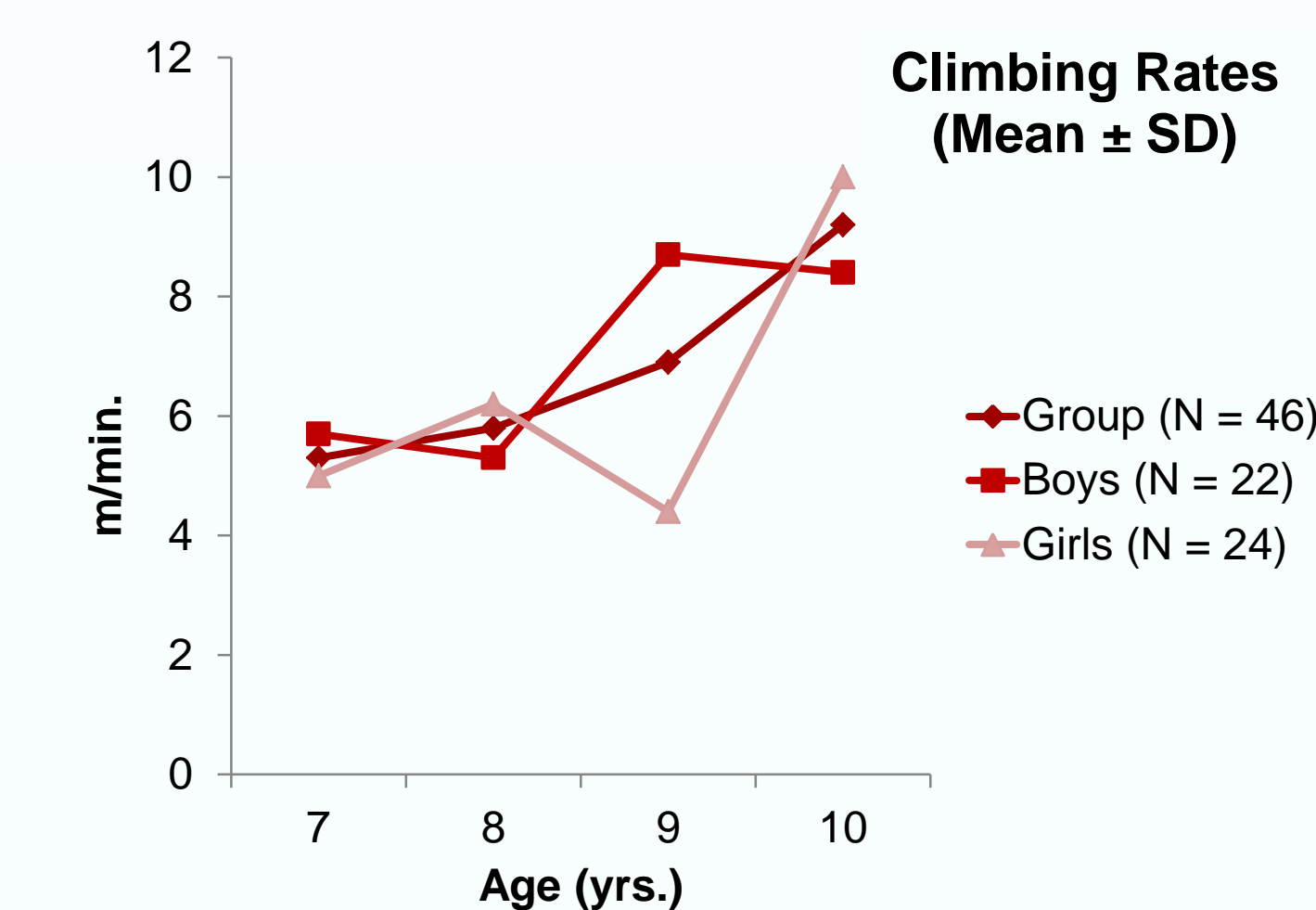
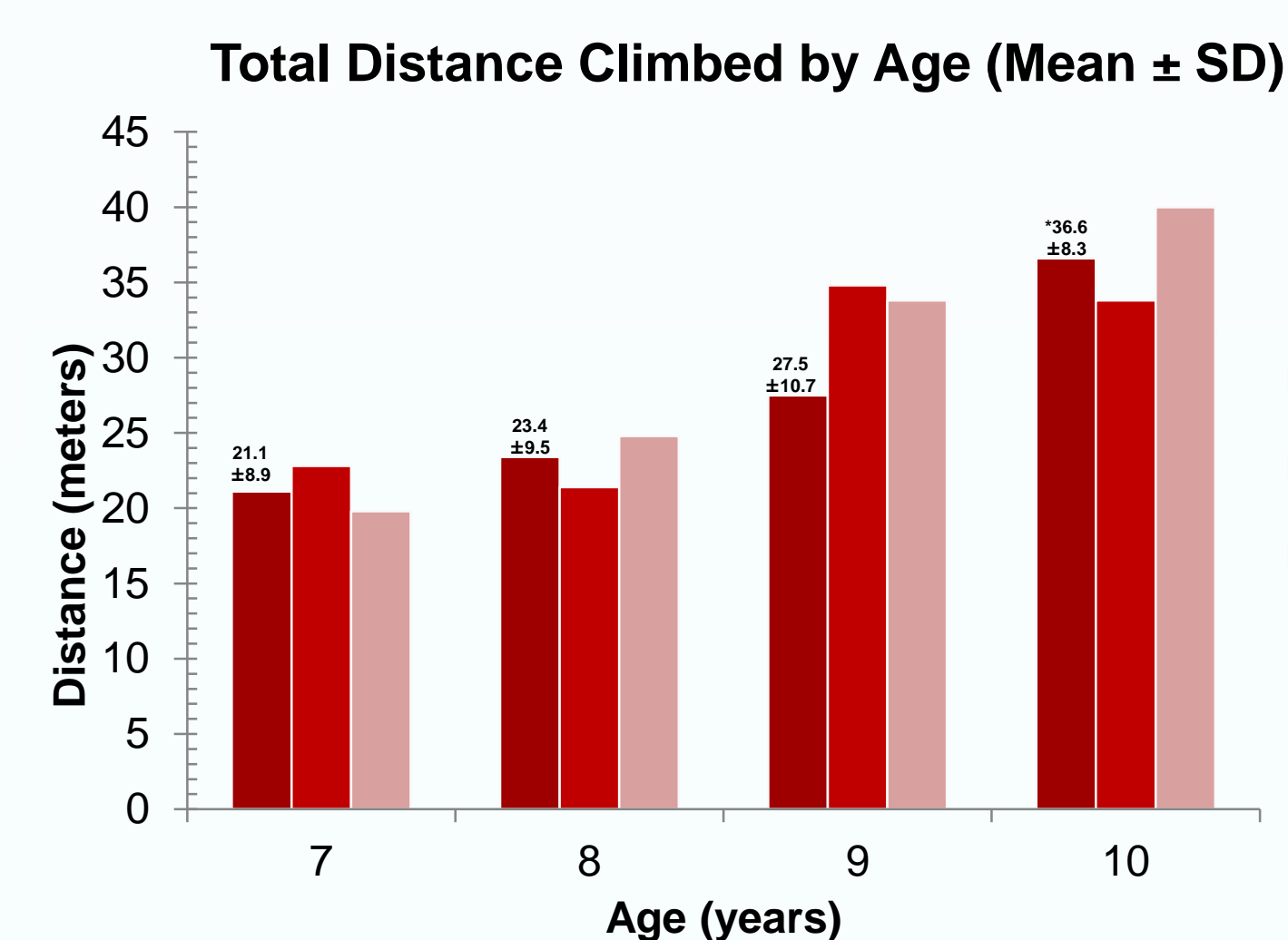
Mean body weight and mean distance climbed were determined as well as the Mean MET value from movement in each axis. Each axis produced a MET value, therefore it was determined the sum of the three axis was the total MET value. Using all subjects a mean MET value for traverse climbing was determined. The total distance climbed for each age group was determined and a one-way ANOVA was used to determine the differences among ages in total distance climbed. Bonferroni *post-hoc* analysis was used to determine the significance of different distances climbed among ages.

Discussion

Children continue to make poor choices by increasing engagement in screen time entertainment at an alarming rate (efforts (Mellecker & McManus, 2008). Children's continued choice in activities that are more sedentary than active continues to contribute to the nation's declining in overall health. As Physical Educators have continued to emphasize the improvement of childhood fitness and health, many have added traverse climbing to their curriculum (Mittelstaedt, 1996). The addition of traverse climbing to the curriculum as a mode to increase fitness and actively engage students appears to be supported as a result of this study. Traverse climbing in this group of children 7-10 years of age was categorized as a "very vigorous" activity. This was a result of movement along a horizontal axis with minimal vertical differences as expected for horizontal climbing. However there was a significant amount of movement on a lateral (closer and farther from the wall) axis.

Many authors have touted the physiological benefits of traverse climbing; however, very little research exists documenting the actual benefits and no research exists documenting the energy demands of traverse climbing on children. Therefore, the purpose of this study was to investigate the amount of energy children use to climb on a horizontal (traverse) climbing wall. Forty-nine participants (7 years to 10 years old) were recruited from a rural public school. Subjects climbed four minutes on a horizontal climbing wall while wearing an Actigraph GT3-X accelerometer on the mid-axial line of the right hip. It was determined that traverse climbing in children when measured along the horizontal axis of movement for 4 minutes was a moderate activity demanding 4 METS and boys had slightly higher expenditure level than girls, even though this difference was not statistically significant. Accelerometer data also showed that vigorous efforts (up to 7 METs) were required for short intervals within the 4-minute time period. Furthermore, one-way ANOVA revealed a significant difference among ages in total distance traveled ($p < 0.01$) and Bonferroni *post-hoc* analysis indicated that the 10-yr old group covered significantly more distance on the horizontal climbing wall compared to the 7 ($p < 0.01$) and 8-yr old ($p < 0.01$) groups. These results provide evidence supporting the use of climbing walls as an activity that promotes significant energy expenditure in children. Furthermore, traverse climbing is a positive alternative replacing similarly intense activities that are less appealing in the public school PE setting.

Results



Conclusions

In conclusion:

- Older children tend to traverse at a faster rate than younger children.
- In isolation, each axis of movement (horizontal, vertical and lateral) resulted minimally in the **moderate** category of METS relative to energy demands.
- In combination of axes of movement (horizontal, vertical, and lateral) horizontal climbing was found to be categorized as a **very vigorous** activity.
- Children tend to be more efficient climbers as they age.

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