

ABSTRACT

Background: Hypertension is one of the top five chronic conditions in children. It is crucial that when determining blood pressure (BP) an accurate measurement is obtained. It is known that BP measurements are influenced by cuff size. Quantifying differences in BP between cuff sizes however have not been described in children.

Purpose of Study: To quantify the differences in BP in children when using different cuff sizes.

Design/Methods: This is a Prospective case control study of healthy children 4-12 years of age visiting Flushing Hospital Medical Center ACC, between Jan-Nov 2018. After obtaining consent, subjects were asked to sit quietly for ten minutes before BP determination. BP was measurement via an automated BP device with an appropriate cuff was obtained, as defined by a bladder width 40% of the right arm circumference. This was followed by BP measurement once cuff size bigger and one cuff size smaller. All BP measurements were done by one observer. Data collected included age, gender, ethnicity, body mass index (BMI), arm circumference, and BP values obtained with different size cuffs. Patients were divided into 4 BMI groups (B1: Underweight, B2: Normal, B3: Overweight, B4: Obese) and any group with < 5 patients was excluded from the analysis.

Results: A sample of 137 patients aged 4-12 years consented to participate in the study. The mean age was 7.6 ±2.5 years, 53% were males, 91% Hispanics. The average BP in B1, B2, B3, B4 was 102/64, 106/66, 112/72 and 116/72. There were no patients with hypertension when measured with the appropriate size cuff. The systolic BP was found to be 5 mm of Hg lower with the larger cuff and 5 mm of Hg higher with the smaller cuff. There was no statistically significant difference between changes in systolic BP for the different age and BMI groups. There was no statistically significant difference found in diastolic BP among the different cuff sizes.

Conclusion: Systolic BP in children is found to be elevated by 5 mm of Hg when measured via a small cuff and is decreased by 5 mm of Hg when measured by a large cuff.

INTRODUCTION

- Hypertension (HTN) is one of the *top five* chronic conditions in children
- It is crucial to determine accurate blood pressure (BP)
- BP measurements are influenced by cuff size
- Quantifying differences in BP between cuff sizes have not been described in children

OBJECTIVE

To quantify differences in BP in children when using different cuff sizes

METHODS

- **Design:** Prospective case control study
- **Settings:** Flushing Hospital Medical Center Ambulatory Care Clinic (FHMC ACC)
- **IRB:** Approved by Flushing Hospital Medical Center
- **Time Frame:** January 2018- December 2018
- **Inclusion criteria:** Healthy children aged 4-12 years visiting FHMC ACC
- **Exclusion criteria:** Children with acute illness (fever), on medication known to affect BP (steroids), known cardiac or medical condition, or uncooperative (crying or agitated)
- **Procedure:** BP recording
- **Tools:** Automated BP device
- **Statistical analyses:** GraphPad Prism, Microsoft Excel, ANOVA, p< 0.05 was considered significant

RESULTS

- Total subjects: 137
- Mean age 7.6±2.5 years, 53% males, 91% Hispanics.
- Systolic BP 5 mm of Hg lower with the larger cuff (p<0.005) and 5 mm of Hg higher with the smaller cuff (p<0.005), Figure 1
- Diastolic BP was statistically significantly different with larger cuff, 2 mmHg (p=0.01), Figure 1
- Diastolic BP was not statistically significant with smaller cuff (p= 0.26), Figure 1
- Changes in systolic BP for the different ages (p=0.65), Figure 2, Figure 3 and for BMI groups (p=0.06), Figure 4

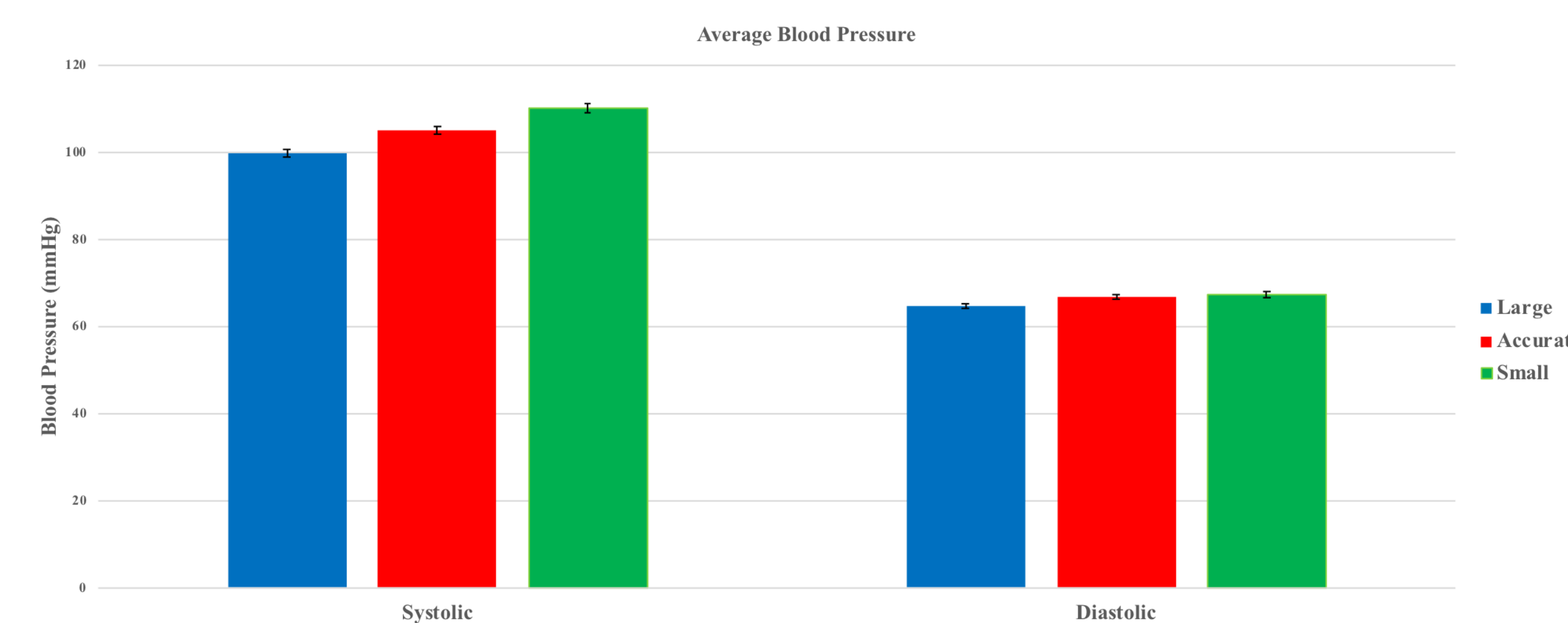


Figure 1: Quantification of BP using different cuff sizes

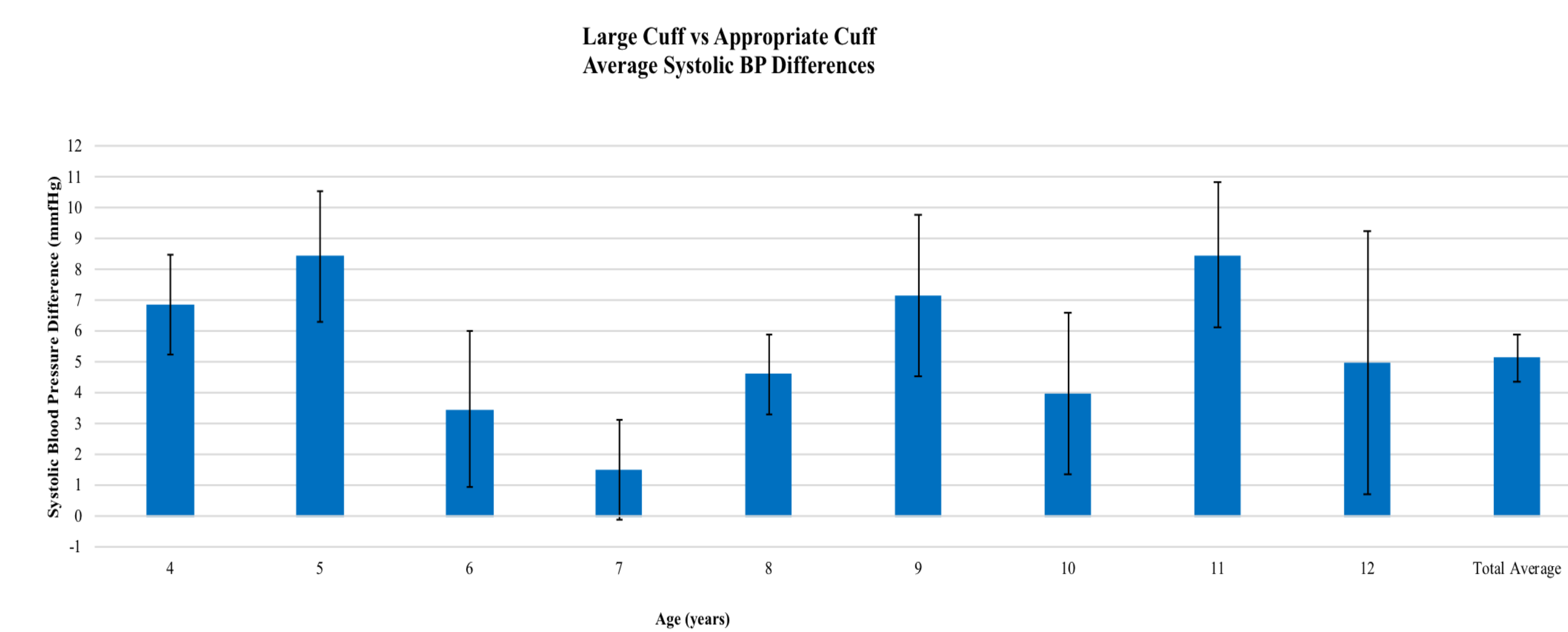


Figure 2: Relationship between different ages and systolic BP differences when using a larger cuff

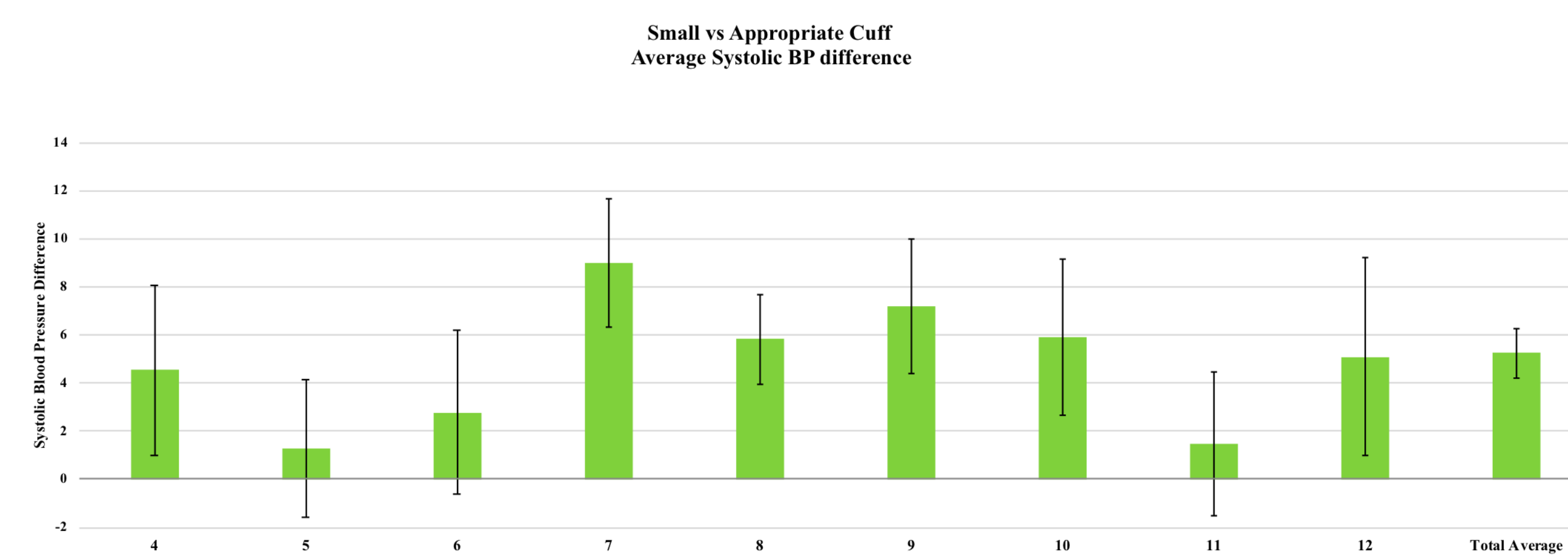


Figure 3: Relationship between different ages and systolic BP difference when using a smaller cuff

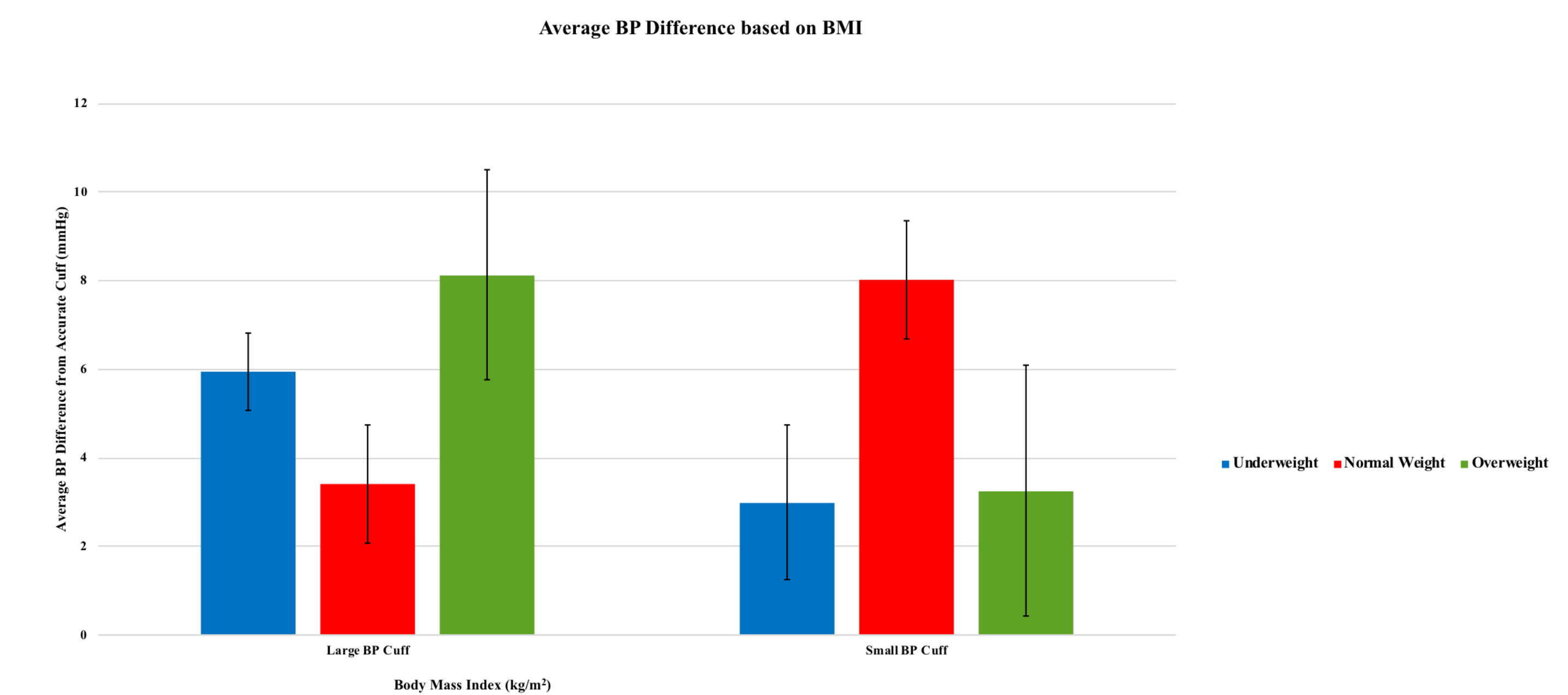


Figure 4: Relationship between BMI and systolic BP using smaller and larger cuffs

CONCLUSIONS

- Systolic BP in children aged 4-12 years was **5 mmHg** higher when measured with a *smaller cuff*
- Systolic BP was **5 mmHg** lower when measured with a *larger cuff*
- Diastolic BP was **2 mm Hg** lower when measured with a larger cuff
- Diastolic BP was not statistically different when measured with a smaller cuff.
- Age and BMI did not affect the differences in BP measurement

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