Development and Validation of a Silhouette Scale to Measure African-American Mothers’ Perception of the Body Size of Their Two to Four Year Old Children

Joan Buckley
*The Graduate Center, City University of New York*

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AFRICAN-AMERICAN MOTHERS’ PERCEPTION OF THE BODY SIZE

DEVELOPMENT AND VALIDATION OF A SILHOUETTE SCALE TO MEASURE AFRICAN-AMERICAN MOTHERS’ PERCEPTION OF THE BODY SIZE OF THEIR TWO TO FOUR YEAR OLD CHILDREN.

by

Joan Buckley

A dissertation submitted to the Graduate Faculty in Nursing in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

2018
Development and validation of a silhouette scale to measure African-American mothers’ perception of the body size of their two to four year old children.

by

Joan Buckley

This manuscript has been read and accepted for the Graduate Faculty in Nursing in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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ABSTRACT

Development And Validation Of A Silhouette Scale To Measure African-American Mothers’ Perception Of The Body Size Of Their Two To Four Year Old Children.

By
Joan Buckley

Advisor: Dr. Martha Whetsell

Background: In the United States (U.S.), the Center for Disease Control (2011 – 2014) reported that one-third of adults and 17% of children between the ages of two and nineteen are obese. Obesity in the U.S. is higher in the African-American groups comprising 13.2 % of the U.S. population. With the link between obesity and chronic diseases, such as, diabetes, heart disease, stroke, and some cancers there is a necessity to understand and reverse the consequences of obesity. There is a need to change the development of obesity/adiposity from childhood to adulthood in African-Americans. Exploring the parent’s awareness of the weight of their children is an important issue when considering cultural aspects of an individual and their perspectives.

Method: African-American mothers (N=15) volunteered their two to four year old children to be photographed and measured during ‘well’ child visits. These photographs and measurements were used by an artist to draw the silhouettes for the ‘Buckley Toddler Scale’ which was then tested for validity and reliability by one hundred and twenty experts.

Findings: The ‘Buckley Toddler Scale’ was a valid and reliable tool to measure an African-American mother’s perception of her child’s body size and as such, mothers were able to accurately describe in common terms: underweight, normal weight, and overweight.

Keywords: Obesity, adiposity, mother’s perception, culture, toddlers
Acknowledgements

I have seen myself reciting this poem by Robert Frost at different times in my life and it has been particularly meaningful since 2010 when I entered the program at the Graduate Center. I need to acknowledge everyone that helped me on this voyage always removing barriers so that the journey did not stop before I was done.

I want to thank Dr. Greta Rainsford for allowing me into her world of Pediatrics, which I will never forget. Thank you to my outstanding committee, some I know well and some that only know my work yet supported me. Thank you to my colleagues in Cohort 5: Abigail, Mary, Alice, Margaret, Patricia, Joy, Layla; and those at Nassau Community College, especially MaryAnn Snow, who I always told was the H in my PhD. A thank you to new friends met along the way, Bill Gallo, Howard Viliers and Tara Aaron.

A special thank you to a friend who did not finish the journey with me but was there at the beginning, Maryann Gallagher.

And a very special thank you to my entire family; son, daughters, sisters, mother, and Declan for your understanding that even though I may have looked like I was not listening I really was, and I am grateful for none of you ever once saying “Stop”!

Last, but never least, a special thank you to Dr. Martha Whetsell who always made me feel ‘Wonderful’!

The Road Not Taken by R. Frost

Two roads diverged in a yellow wood.  
And sorry I could not travel both  
And be one traveler, long I stood  
And looked down one as far as I could  
To where it bent in the undergrowth;

Then took the other, as just as fair,  
And having perhaps the better claim  
Because it was grassy and wanted wear,  
Though as for that the passing there  
Had worn them really about the same,

And both that morning equally lay  
In leaves no step had trodden black.  
Oh, I kept the first for another day!  
Yet knowing how way leads on to way  
I doubted if I should ever come back.

I shall be telling this with a sigh  
Somewhere ages and ages hence:  
Two roads diverged in a wood, and I,  
I took the one less traveled by,  
And that has made all the difference.

Dedication

This work is dedicated to my husband, Paul, who strolled, watched and patiently waited for me to finish the walk down this road in the wood.
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Chapter 1. Introduction

Background

Increases in adiposity have been seen in the United States, with 12.5 million children now affected, and in Figure 1.1, data from the National Health and Nutrition Examination Survey is presented. The Centers for Disease Control (CDC) (2014) reported that in the United States, more than one-third of adults, and 17% of children between the ages of two and nineteen, are obese (Ogden, Carroll, Kit, & Flegal, 2014) (see Figure 1.2). Childhood obesity in the U.S. is more prevalent in non-Hispanic African-American than in other racial/ethnocultural groups (see Figure 1.3), and adults are similarly affected. Among African-Americans, seventy percent of men and eighty percent of women are considered overweight, defined as a body mass index (BMI) > 25; and forty-four percent of women and thirty-four percent of men are obese, defined as BMI > 30 (U.S. Department of Health and Human Services Office of Minority Health, CDC, 2017).

The scale and consequences of this problem are immense, as African-Americans are the second largest ethnocultural group, comprising 13.2% of the U.S. population (U.S. Census 2014; Purnell, 2014). A 2015 Health and Human Services report indicated that obesity-related chronic conditions—particularly diabetes, heart disease, and stroke—are more prevalent in African-Americans than other ethnic groups. As such, there is a need to understand and reverse the life-threatening consequences of obesity in this high-risk population (Go, Mozaffarian, Roger, Benjamin, Berry, Borden, & Turner, 2013; U.S. Department of Health and Human Services Office of Minority Health, CDC, 2017).

To address this major global health and nutrition problem, there must be a clear understanding of the pathogenesis of obesity. The chronicity of this condition requires a true knowledge of the pathophysiology of adipose tissue to respond to the unrelenting epidemic that affects the health of children (Poissonnet, Lavelle, 1998; WHO, 2012). Therefore, in order to
change the development of adiposity there must be a reasonable standard that would identify an obese child. Variations from this standard may be related to ethnicity or race and there is a need to explore the groups of people that are not doing this identification properly. There is an essential need to recognize, explore, and eliminate factors that influence the identification of adiposity in children worldwide (Rietmeijer-Mentink, Paulis, van Middlekoop, Bindels, & van der Wouden, 2013; Wofford, 2008; Young, et al., 2010).

Parents’ perceptions of unhealthy weight among children and an understanding of the health consequences of obesity are key issues for healthcare practitioners to discuss with parents (Jeffery, Voss, Metcalf, & Wilkin, 2005). Parents’ lack of awareness of and concern for obesity in their children may be associated with the growing normalization and acceptance of body fat (Maynard, Galuska, Blank, & Serdula, 2003; Lopes, Santos, Pereira, & Lopes, 2012; Leppers, Tiemeire, Swanson, Verhulst, Jaddoe, Franco, Jansen, 2017). Misperception of childrens’ body size may be consequential, as it could lead to inappropriate feeding behaviors and inadequate health- and nutrition-promoting strategies (Hager, Candelaria, Latta, Hurley, Wang, Caulfield, Black, 2012; Leppers, et al., 2017). Identification of obesity in ‘young’ children by their parents can have an impact on the Practitioner’s ability to develop interventions that could modify the environment and lifestyle of the child (Hager, Candelaria, Latta, Hurley, Wang, Caulfield, Black, 2012; Leppers, et al., 2017; Garcia, Sato, Trude, Eckman, Steeves, Hurley, Gittelsohn, 2018).

The identification of failure to thrive, growth failure, or obesity that is not due to a pathological abnormality, but rather due to malnutrition, is a primary focus of healthcare providers caring for the multicultural pediatric population (Jaffe, 2011). Nevertheless, there are studies that demonstrate a parent has the ability to accurately classify ‘older’ childrens’ body size
which provides a measure of optimism for future researchers and clinicians focused on ‘young’ children (Maynard, Galuska, Blank, & Serdula, 2003; Lopes, Santos, Pereira, & Lopes, 2012).

In the absence of health-promoting cultural influences, healthcare providers often comprise the initial line of obesity prevention with cultural understanding critical to communicating vital information (Rietmeijer-Mentink, Paulis, van Middelkoop, Bindels, & van der Wouden, 2013). Providers who serve African-American patients must perform culturally sensitive health assessments, possessing awareness of ethno-cultural preferences and practices regarding food and body image. Cultural sensitivity must also be applied to educating parents to recognize adiposity in their children. Purnell’s Model for Cultural Competence (2014) provides a framework that organizes and guides healthcare, education and research with cultural sensitivity and competence within a multicultural environment. Purnell’s framework has been adapted for use as a cultural assessment model that will explore and provide a culturally sensitive understanding of the obesity epidemic among African-Americans and allow the practitioner to provide culturally relevant care.

The misperception of obesity is widespread. Eighty-six percent of parents with children between two and six years of age fail to recognize their children as overweight (Rietmeijer-Mentink, Paulis, van Middlekoop, Bindels, & van der Wouden, 2013). A possible explanation for parental inadequacies is that emotional involvement biases parents toward observing more favorable traits than actually exist (Hager, Candelaria, Latta, Hurley, et al., 2012; Leppers, et al., 2017).

Family and pediatric practitioners are in a unique position to influence childhood obesity via primary prevention (Rietmeijer-Mentink, Paulis, van Middelkoop, Bindels, & van der Wouden, 2013), and culturally competent clinician behavior in the setting of well-child visits may
be effective in helping parents identify children at risk for obesity (Young, DeBry, Jackson, Metos, Joy, Templeman, & Norlin, 2010; Purnell, 2014). Silhouette scales, which illustrate children along a finite spectrum, from underweight to obese, are a useful tool for clinicians to help African-American parents identify when their children are at risk for effects of adiposity. These tools may have an impact on obesity outcomes both nationally and globally.

Figure 1.1. Unadjusted Tests of Linear Trends of High Weight for Length and Obesity by Age, United States, 2011-2012

![Figure 1.1](image)

Obesity for youth ages 2-19 years defined as Body mass index (BMI) at or above the 95th percentile on the CDC sex-specific BMI for age growth charts. Data from the National Health and Nutrition Examination Survey.

*Adapted from Ogden et al, 2014.

Figure 1.2. Prevalence of High Body Mass Index (BMI) by Selected Cut Points for Adults >20 Years, by Age, and Race/Hispanic Origin 2011-2012

![Figure 1.2](image)

Obesity for Adults 20 yrs or older BMI > 35

*Adapted from Ogden et al, 2014.
Background of the problem

The increase in childhood obesity and the role it plays in the development of chronic diseases is of great concern worldwide (Cole, 2004; Liebman, 2018). The increase in diabetes, cardiovascular disease, hypertension, and cancer throughout the United States and other affluent countries will overwhelm healthcare systems if efforts are not made to reverse the long-term effects of childhood obesity (Bergman, Stefanovski, Buchanan, Sumner, Reynolds, Sebring, Xiang, & Watanabe, 2011). Current trends of obesity in the U.S. suggest that the steady rise in life expectancy occurring over the past two centuries may soon come to an end (Olshansky, Pessaro, Hershov, Leyden, Carnes, Brody, Hayflick, Butler, Allison, & Ludwig, 2005). Pediatric obesity has continued to increase in recent years and has become a serious public health problem that frequently goes unrecognized (Hager, McGill, Black, 2010). In the past, various methods developed to measure adiposity in children were limited by the age of the child, cost, time, and
accuracy (Bergman, Stefanovski, Buchanan, Sumner, Reynolds, Sebring, Xiang, & Watanabe, 2011).

**Statement of the problem**

The prevalence of childhood obesity has tripled over the past 40 years and has contributed to the belief that the next generation of children may not outlive their parents (Olshansky, Pessaro, Hershow, Leyden, Carnes, Brody, Hayflick, Butler, Allison, & Ludwig, 2005; Franks, Hanson, Knowler, Sievers, Bennett, Looker, 2010). Child obesity is associated with numerous health conditions that are linked to premature mortality, decreased quality of life, high blood pressure, type 2 diabetes, high cholesterol, sleep apnea, depression, low self-esteem and teasing. Moreover, overweight children are at the greatest risk of becoming overweight adults in the African-American population (Abrams, Katz, 2011; Baskin, Thind, Affuso, Gary, LaGory, & Hwang, 2013).

**Purpose of the Study**

The purpose of this study is to develop and validate a silhouette scale to measure African-American mothers’ perception of body size of their two-to-four-year-old children (underweight normal, and overweight). To date, there is no simple and cost-effective tool that is able to accurately measure African-American mothers’ perception of the body size of their 2-4 year-old children. Therefore, an instrument that is able to provide this information is necessary for early identification of this phenomenon.

**Theoretical Framework**

Two theories will guide this dissertation to explain the effect of the environment on the decision-making capabilities of individuals. Bandura’s (1986) Social Cognitive Theory (SCT) explains cognitive, behavioral, and environmental factors that affect decisions made by
individuals. The bi-directional pattern of personal, behavioral and environmental factors contributes significantly to the level of functioning of that individual (Bandura, 1989). The three components of SCT are particularly significant because they are hypothesized to be the components of the African-American mothers that influence their perception of their children’s body size (see Figure 1.6). Developing competencies through modeling, strengthening people’s beliefs in themselves and their abilities, and improving goal setting through self-motivation are three key aspects of SCT (Bandura, 1989) (See Figure 1.4).

Figure 1.4. Bandura’s (1986) Social Cognitive Theory (SCT)

The Purnell Model for Cultural Competence (2000, 2002) provides the context for understanding the primary and secondary characteristics of culture, which determine variations in beliefs, practices, and values of individuals and their influence on perceptions about body image. The metaparadigm concepts of person, family and community, support the notion that the child does not stand alone and is defined in the context of the family and the broader arena of community (Purnell, 2000).

The Purnell Model (2014) is organized within a framework that is illustrated as a circle with three rings or rims. The outer rim represents the global society; the second rim represents the community; the third rim the family; and the dark empty center depicts all of the unique
qualities that are known and represent the person. In addition, the 12 related cultural domains intersect at this innermost portion of the model and embody what is unknown about the cultural group/person, including its/their perception of health and healthcare (Purnell, 2002).

The family, which consists of two or more people who are emotionally involved with each other and share common beliefs and values, can be applied to the mother–child dyad (Purnell, 2000). Children make an impact on families. Families influence children and families interact within communities. Families work to hold on to values and beliefs that they consider important as they continuously adapt to and cope with societal changes (Purnell, 2000). Figure 1.5 illustrates the bi-directional relationships among and between each of the domains (Purnell, 2002). Flexibility and a holistic approach are required as nurses apply these concepts within a diverse environmental context (Purnell, 2002).

The Purnell model is appropriate in primary prevention because it promotes culturally competent and sensitive care that focuses on individuals, family, and community (Purnell, 2002). According to the model’s domains, nutrition includes the meaning of food, common foods and rituals; nutritional deficiencies and food limitations; and the use of food for health promotion and restoration from illness, and disease prevention (Purnell, 2002). Health care practices include preventive, traditional, magic religious and biomedical beliefs and views toward illness and chronicity (Purnell, 2002). The biocultural ecology domain will be tailored to the child and will include physical, biological, and physiological variations of different ethnic and racial groups including genetic observations that require a culturally sensitive assessment by a culturally competent practitioner.

The domain of the health care practitioner includes concepts related to use, provision and perceptions of traditional, magic religious and Western bio-medical health care (Purnell, 2002).
The model suggests that when nurses assess and plan within the health care practices and view the family in a culturally competent manner, interventions will result in improved outcomes. The model focuses on care provided to individuals, family and community that is culturally competent and sensitive (Purnell, 2002).

Systematically examining cultural domains and their relationship to mothers’ and children in their cultural environment facilitates the understanding of the multidimensional forces influencing perceptions, opinions and health related intentions. The assumption of the powerful influence of culture on individuals’ interpretation and response to health and illness should guide health care providers’ actions (Purnell, 2000, 2002). Cultural and societal factors play a major role in determining childhood BMI and body adiposity index (BAI) (Bergman, Stefanovski, Buchman, Somner, Reynolds, Sebring, Xiang, Watanabe, 2011). Differences in feeding practices of children exist among cultural groups and are influenced by cultural variations of how growth is perceived (Purnell, 2014). The perception of healthy weight and growth can then be seen to vary between different cultures (Purnell, 2014).

With obesity a global crisis associated with widespread morbidity and mortality in adults, and more recently identified in children, it is the Purnell Model for Cultural Competence (2000, 2002) that may influence interventions to reverse this trend and guide the development of the silhouette tool (Abrams & Katz, 2011). Disparities in health and healthcare vary across ethnic, social, and economic groups. Health-care providers need to understand and respect cultural diversity in order to achieve a high level of cultural competency. A cultural perspective and understanding of those at high risk for disease processes that present later in life, require practitioners to follow a model that provides a framework that includes all questions asked of all
ethnic groups that formulates the appropriate individual plan of care (Gower, Nagy, Trowbridge, Duesenberrg, Goran, 1998) (see Figure 1.6).

Figure 1.5. The Purnell Model for Cultural Competence (2014).

![The Purnell Model for Cultural Competence](image)

**Variant cultural characteristics:** age, generation, nationality, race, color, gender, religion, educational status, socioeconomic status, occupation, military status, political beliefs, urban versus rural residence, endave identity, marital status, parental status, physical characteristics, sexual orientation, gender issues, and reason for migration (sojourner, immigrant, undocumented status).

**Unconsciously incompetent:** not being aware that one is lacking knowledge about another culture  
**Consciously incompetent:** being aware that one is lacking knowledge about another culture  
**Consciously competent:** learning about the client’s culture, verifying generalizations about the client’s culture, and providing culturally specific interventions  
**Unconsciously competent:** automatically providing culturally congruent care to clients of diverse cultures
Figure 1.6. Conceptual model for the development and validation of a silhouette scale to measure African-American mothers’ perception of body size of their two to four year old children (generated from ‘The Purnell Model for Cultural Competence’, 2014).

Importance of the study

Obesity is widespread and increasing in the U.S., with 17% of children between the ages of two and nineteen considered obese (Ogden, Carroll, Kit, Flegal, 2014). Obesity contributes to chronic illnesses and premature death, and prevalence is disproportionately higher among African-Americans, according to the American Heart Association (2012). Finding ways to modify the risks of obesity and chronic diseases related to obesity, is needed to improve health outcomes (Go et al., 2013). Culturally competent health assessments, aided by a silhouette scale that measures mothers’ perception of adiposity in their two to four year old African-American children are key components of providing quality healthcare. To date, there is no such silhouette scale.

The intention of this research is to provide a culturally specific approach to the measurement and diagnosis of obesity. Ethnic background, according to Greaves, et al. (1989), states that ethnicity affects fat distribution in children (Greaves, Puhl, Baranowski, Gruben, Seale, 1989). It has also been asserted that African-American children and adults have greater skinfold
thicknesses in the central region (Greaves, Puhl, Baranowski, Gruben, Seale, 1989). Since most prior studies of ethnic differences in fat distribution have been limited to skinfolds, it is unknown whether the findings represent differences in intra-abdominal adipose tissue (IAAT) or subcutaneous adipose tissue (SAAT) (Conway, Yanovski, Avila, & Hubbard, 1995).

BMI has been used for decades to identify who is overweight or obese (Rahman, & Berenson, 2010). The data sets specific percentiles recommended for use with children that are linked to the adult BMI cut off points (Cole, Bellizzi, Flegal, & Dietz, 2000). The BMI uses height and weight and when the weight could be influenced by the amount muscle mass the person has, it may not be an accurate measurement with all body types. The BMI, despite its use in clinical practice, is not accurate in measuring adiposity in individuals with an ‘out of the ordinary’ body mass (Bergman, Stefanovski, Buchanan, Sumner, Reynolds, Sebring, Xiang, & Watanabe, 2011; Gomez-Campos, Langer, Guimaraes, Contiero San Martini, Bolanos, de Arruda, Guerra-Junior, Goncalves, 2016). It is necessary to consider other methods to accurately calculate the amount of adipose tissue in an individual.

Additional ways to accurately measure adiposity in high risk groups include underwater weighing and dual-energy X-ray absorption (DXA) settings (Bergman, et al., 2011; Gomez-Campos et al., 2016). The Body Adiposity Index (BAI) uses the relationship of hip circumference and height to measure adiposity (see Table 1.1). This simple and inexpensive method matches the accuracy of underwater weighing and DXA, according to Bergman, et al. (2011). BAI has been used as a predictor of health outcomes, and it will be used in this study to develop and validate a silhouette scale that will identify the African-American mothers’ perception of the body size of their children between two and four years old.
Table 1.1. The BAI formula for % Adiposity

<table>
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<th>The BAI formula for %Adiposity</th>
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| \[
| BAI = \frac{\text{Hip}}{\text{Height} \sqrt{\text{Height}}} - 18
| \]

Research Question

Development of a silhouette scale, based upon culturally competent assessment that accurately identifies adiposity in African-American children between two and four years old, may assist African-American mothers to accurately recognize the body size of their children.

The research question is: What is the validity of a silhouette scale that measures African-American mothers’ perception of body size in their two to four year old children?

Limitations

The strict inclusion and exclusion criteria may limit the number of eligible participants.

Parents may decline to participate for many reasons (see Table 1.2).

Table 1.2. Limitations

| 1. | Due to mistrust of healthcare providers based on previous negative encounters. |
| 2. | Lack of cultural awareness in Practitioners. |
| 3. | Ineffective communication by the practitioner or Principal Investigator (PI). |
| 4. | Participants may be unaware of adiposity as a health problem. |
| 5. | Participants may perceive no related benefit related to participating in this research study. |
**Delimitations**

The strict inclusion and exclusion criteria can also be a delimitation, as it will assure specific characteristics of the sample. BAI is an inexpensive, simple, and accurate measure of adiposity and it can be done quickly and easily during a well-child visit. The delimitations in the research are displayed in Table 1.3.

**Table 1.3. Delimitations**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Children less than 24 months and children greater than 48 months excluded.</td>
</tr>
<tr>
<td>2.</td>
<td>Children with only one parent self-identifying as an African American will be excluded.</td>
</tr>
<tr>
<td>4.</td>
<td>Children with mothers that have had gestational diabetes or heart disease will be excluded.</td>
</tr>
<tr>
<td>5.</td>
<td>Children will not be included if either parent has diabetes mellitus type I or diabetes mellitus type II, hypothyroidism or hyperthyroidism, cancers, AIDS, gastro-enteropathies with malabsorption issues.</td>
</tr>
<tr>
<td>6.</td>
<td>All of the children will have been born between 37 and 40 weeks gestational age.</td>
</tr>
<tr>
<td>7.</td>
<td>All children will have been born weighing between 7.5 and 9 pounds.</td>
</tr>
<tr>
<td>8.</td>
<td>None of the children will have any diseases that are known to affect body composition or fat distribution or health (e.g., Cushing’s disease, Downs Syndrome, type 1 diabetes, Barraquer-Simons disease, gastro-enteropathies, or food allergies).</td>
</tr>
<tr>
<td>9.</td>
<td>None of the children will be taking any medications that are known to affect body composition (e.g., growth hormone, methylenidate).</td>
</tr>
</tbody>
</table>
Operational Definitions

For the purposes of this research study, the following operational definitions will be used and are described in Table 1.4.

Table 1.4. Operational definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adiposity</td>
<td>Adiposity is the development of cellular events that are the cause of obesity (Poissonnet, LaVelle, 1998).</td>
</tr>
<tr>
<td>Adiposity rebound (AR)</td>
<td>AR is recognized as a period of rapid growth in body fat where adipocytes increase in both size and number (Rolland-Cachera, Deheeger, Akrout, Bellisle (1995).</td>
</tr>
<tr>
<td>Adipocytes</td>
<td>Adipocytes are fat cells (Dorland’s Medical Dictionary, 1989). Adipocytes are connective tissue cells that specialize in storing energy as fat, mainly triglycerides, in organelles called lipid droplets (Tortora, Derrickson, 2014). Two major types of adipocytes are: white adipocytes, which contain one large lipid droplet and are involved in fat storage, and brown adipocytes, which have many smaller lipid droplets and numerous mitochondria that generate energy, and maintain body temperature (Tortora, Derrickson, 2014). Adipocytes are found deep in the skin and around organs such as the heart and kidneys (Tortora, Derrickson, 2014).</td>
</tr>
<tr>
<td>Adipogenesis</td>
<td>Adipogenesis is the study of the growth and development of adipose tissue (Poissonnet, LaVelle, 1998).</td>
</tr>
<tr>
<td>Anthropometry</td>
<td>Anthropometry is the science that defines physical measures of a person’s size, form, and functional capacities (CDC, 2014).</td>
</tr>
<tr>
<td>Arm circumference</td>
<td>Arm circumference is the simplest of all anthropometric measurements. It is the measurement with a tape measure of the maximum circumference of the arm midway between shoulder and elbow (Jelliffe, 1969).</td>
</tr>
<tr>
<td>Body adiposity index (BAI)</td>
<td>Body adiposity index (BAI) is defined as the measurement of (hip circumference / height) – (18). BAI can be used to reflect the percentage of body fat for adult men and women of different ethnicities without numerical correction for gender (Bergman, Stefanovski, Buchanan, Sumner, Reynolds, Sebring, Xiang, Watanabe, 2011).</td>
</tr>
<tr>
<td>Body mass index (BMI)</td>
<td>BMI is defined as the ratio of weight to height squared: called Quetelet’s Index. BMI = body weight (kg)/height (m)² (kg/m²) (Bergman, et al., 2011).</td>
</tr>
<tr>
<td>Calipers</td>
<td>Skinfold calipers are defined as instruments (SC) typically used to determine subcutaneous fat thickness (Selkow, Pietrosimone, Saliba, 2011).</td>
</tr>
<tr>
<td><strong>Height</strong></td>
<td>Height is defined as the measurement of a person in inches/centimeters using a stadiometer to the nearest 0.1cm (DeLorenzo, Binchi, Maroni, Iannarelli, DiDaniele, Iacopino, Renzo, 2013).</td>
</tr>
<tr>
<td><strong>Hip measurement</strong></td>
<td>Hip circumference measurement is the measure taken at the widest portion of the buttocks (WHO, 2008).</td>
</tr>
<tr>
<td><strong>Obesity</strong></td>
<td>Obesity is defined as an excess of adipose tissue relative to lean body mass (Poissonnet, LaVelle, 1998). Obese children are defined as those who have an age and gender specific BMI $\geq 95^{th}$ percentile (Ogden, Carroll, Flegal, 2006). Obesity is a BMI of 30 and above, according to the NIH. The World Health Organization (WHO) defines obesity as a condition in which percentage body fat (PBF) is increased to an extent in which health and well-being are impaired (WHO, 2000).</td>
</tr>
<tr>
<td><strong>Obesogenic environment</strong></td>
<td>An obesogenic environment is an environment or area that is likely to promote weight gain and obesity in individuals or populations (Mackenbach, Rutter, Compernolle, Glonti, Oppert, Charreire, Lakerveld, 2014; DeBourdeaudhuij, Brug, Nijpels, Lakerveld, 2014).</td>
</tr>
<tr>
<td><strong>Overweight</strong></td>
<td>Overweight is defined by the National Institute of health (NIH) (2015) in terms of BMI (the body mass index), which is weight in kilograms (kg) divided by height in meters (m) squared. Since the BMI describes the body weight relative to height, it correlates strongly (in adults) with the total body fat content. Overweight is a BMI of 27.3 % or more for women and 27.8 % or more for men, according to the NIH. Obesity is a BMI of 30 and above, according to the NIH.</td>
</tr>
<tr>
<td><strong>Silhouette Scale</strong></td>
<td>Silhouette scales are defined as simple, useful tools used to assess body size perception and satisfaction for children and adults (Mayer, 1978).</td>
</tr>
<tr>
<td><strong>Waist Circumference</strong></td>
<td>Waist circumference (WC) is defined as the measurement at the midpoint between the lowest rib and the top of the iliac crest (Bigornia, LaValley, Benfield, Ness, Newby, 2013).</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Weight is defined as the measurement of the person to the nearest 0.1 kg, using a balance scale (DeLorenzo, Binchi, Maroni, Iannarelli, DiDaniele, Iacopino, Renzo, 2013).</td>
</tr>
</tbody>
</table>
Chapter Summary

Obesity is a public health problem that affects both adults and children whose prevalence is disproportionately higher in African-Americans than other racial and ethnic groups. Obesity is a risk factor for chronic illnesses and premature death. Adiposity in children ages two to four years can extend throughout adulthood, but is, however, modifiable. Pediatric and family nurse practitioners who conduct culturally competent assessments of African-American children can teach parents how to identify, explore, and eliminate factors that influence the development of adiposity in children. Development of a simple and accurate early-identification tool, such as a silhouette scale, may prevent obesity related chronic illnesses before the onset of overt symptoms.

This chapter provided an introduction of adiposity and its effect on African Americans; background of the problem; purpose of the study; operational definitions and theoretical framework of the Bandura's Social Cognitive Theory (1989). The SCT as it explains a mother’s positive beliefs and sense of self efficacy, combined with Larry Purnell’s Cultural Competence Model (2014), is the basis and support for this study. A silhouette scale will identify those children at highest risk for adverse health-related outcomes. Chapter 2 will present a review of the literature that identifies obesity and adiposity in African-American children two to four years of age, health effects of obesity, cultural perceptions and influences that relate to nutrition and obesity, and the need for culturally competent health assessments.
Chapter 2. Review of the Literature

Introduction

An extensive literature review was performed with the goal of identifying gaps in the existing evidence that support the need for a silhouette tool that measures African-American mothers’ perception of adiposity in their children between the ages of two to four years. This literature review is not intended to function as a meta-analysis of quantitative findings; rather, it takes into account information from quantitative research, qualitative studies, and literature reviews to garner a broader understanding on the topic. This chapter provides a summary of the current body of knowledge to provide a comprehensive account of the topic (Gould, 1994).

The search for existing literature on silhouette tools and African-American mothers’ perception of their children’s body size was executed in two stages. In the first stage, keywords (adiposity, obesity, measuring adiposity/obesity, infants, children, scales, silhouette scales, effects of culture, and maternal perception) were used alone and in combination to search the databases of Academic OneFile, CINHAL, PubMed, EBSCO, Medline, and Google Scholar. No language restrictions were used in the search; however, only English articles were retrieved. Consideration was paid to include articles from a variety of countries; such as, United States (U.S.), United Kingdom, Brazil, Hong Kong, the Netherlands and Singapore.

The second stage of the literature search entailed the identification of a subset of the most relevant articles from the initial investigation, and adding other works identified in the references of these articles using a “snowball technique” (Scallan, 2003). Relevant books were included, as well. All publications were published between the years 1969 and 2017. Ultimately, the full text of 127 journal articles and book chapters were included in the literature review.
**Obesity/Adiposity**

In 2013, over one billion adults globally were considered overweight, of which, nearly half were obese (World Health Organization, 2015). Over 30% of adults and 17% of children in the United States fit the criteria for obesity as per the body mass index (BMI) and age growth recommendations put forth by the Centers for Disease Control (CDC) (Centers for Disease Control and Prevention, 2015a; Ogden, Carroll, Kit, & Flegal, 2014).

Measuring adiposity in a person, entails an assessment of the body’s adipose tissue composition in utero and, using fetal tissue composition, one can obtain and assess measurements that will remain important throughout the lifetime of an individual. Numerous studies (see Table 2.1) regarding the role and growth of adipose tissue reveal the ability of the human body to sustain itself through the differentiation of cells in utero and throughout a person’s life. In Toro-Ramos, et al. (2015) gestational cadaver and fetal studies, the timing and accretion rates of both adipose and lean tissue are able to be determined; this information is extremely useful in diagnosing diseases and certain conditions (Toro-Ramos, Paley, Pi-Sunyer, & Gallagher, 2015). There is a need for further information on how the body’s composition, including adiposity, is associated with chronic diseases in the adult population (Tores-Ramos, et al, 2015).

An increased understanding of obesity is of major importance to appreciating the pathogenesis of all body’s cells and the development of adipose tissue (Poissonnet, LaVelle, & Burdi, 1988). Knittle, et al. (1979) collected data relating to the rate and type of adipose tissue development in children and connected its role to the development of fat deposits in adult subjects. The amount of brown adipose tissue deposited was correlated inversely with the BMI and shown to have a potential role in adult metabolism and obesity (Cypess, Lehman, Williams, Tal, Rodman, Goldfine, Kuo, Palmer, Tseng, Doria, Kolodny, & Kahn, 2009).
Research carried out by Choquet & Meyre (2011) has contributed to a better understanding of the heritability of obesity and the discovery of genetic links to eight monogenic genes and four polygenic genes. After 15 years of gene identification, the researchers confirmed that there are subgroups of the population that are particularly vulnerable to obesity. Traditional approaches to the management of overweight and obese persons have poor long-term efficacy; considering genetic predispositions, ethnicity, and environmental factors are important to the prevention and treatment of obesity (Choquet, & Meyre, 2011).

Bouchard (2007) also explored genetic predisposition as it relates to excess weight gain. His research lends further credence to the idea that there is a biological predisposition to obesity. More specifically, he explored the possibility that adiposity growth is associated with epigenetic events during fetal growth or early post-natal development. Boonpleng, Park, & Gallo (2012) consider the identification of adiposity rebound (AR) a key factor in obesity trajectories, suggesting that the age at which this critical event occurs may predict the onset of adult obesity. It is clear that underlying genetics and biology of obesity are essential to a full-understanding of predictors of obesity (Bouchard, 2007). Studies that include genetic factors and identification of obesogenic environments will have the greatest impact on the prevention and treatment of obesity (Mackenbach, Rutter, Compernolle, Glonti, Oppert, Charreire, et al., 2014).
### Table 2.1. Summary of studies that explain the physiology of adiposity

<table>
<thead>
<tr>
<th>Author(s), year, title</th>
<th>Purpose</th>
<th>Study design</th>
<th>Sample</th>
<th>Objective</th>
<th>Findings</th>
<th>Gaps/Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knittle, Timmers, Ginsberg-Felthea (1979). ‘The growth of adipose tissue in children and adolescents’.</td>
<td>Determine changes in size and number across time in children.</td>
<td>Quantitative: Cross-Sectional and longitudinal study</td>
<td>N=288 4 mos. -19 yrs. Follow up study N=132</td>
<td>To observe adipocyte size and number in subjects across 4 years</td>
<td>Data indicated that the rate &amp; type of adipose cellular development in children may play role in development of enlarged fat deposits found in obese subjects.</td>
<td>Physiology of adiposity</td>
</tr>
<tr>
<td>Pinsonnet, LaVelle, Bardi (1988). ‘Growth and development of adipose tissue’.</td>
<td>Summarize the major advances, with emphasis on recent experimental findings.</td>
<td>N/A</td>
<td>N/A</td>
<td>Provide information that will lead to an understanding of the pathogenesis of obesity.</td>
<td>Description of adipogenesis at all stages of development.</td>
<td>Physiology of adiposity</td>
</tr>
<tr>
<td>Cypress, Leeman, Williams, Tal, Rodman, Goldfine, Kuo, Palmer, Tseng, Doria, Kolodny, Kahn, (2009). ‘Identification and importance of brown adipose tissue in adult humans’.</td>
<td>Identify the relationship of brown adipose tissue to obesity in adults.</td>
<td>Quantitative</td>
<td>N=1972 with F-FDG Scans and PET CT scans were analyzed for various reasons reviewing the presence of substantial deposits of suspected to be brown adipose tissue</td>
<td>Identifying the role and use of brown adipose tissue.</td>
<td>Brown adipose tissue was related to: - years of age (P&lt;0.001) - outdoor temperature (P=0.02) - beta blocker use (P&lt;0.001) - older adults, BMI (P=0.007)</td>
<td>Physiology of adiposity</td>
</tr>
<tr>
<td>Choquet, Meyre (2011). ‘Genetics of Obesity: What have we learned’?</td>
<td>This was an overview of lessons learned from past 15 years’ research in the fields of genetics and obesity.</td>
<td>Quantitative – secondary data analysis</td>
<td>N/A</td>
<td>To provide evidence that obesity predisposing genes interact with the environment and influence the response to treatment relevant to disease prediction.</td>
<td>Prevention may be the likely strategy for the obesity epidemic.</td>
<td>Physiology of adiposity – genetics and environment actors</td>
</tr>
<tr>
<td>Mackenbach, Rutter, Compernolle, Glazi, Oppert, Charreire, et al. (2014). Obesogenic environments: a systemic review of the association between the physical environment and adult weight status, the SPOTLIGHT project.</td>
<td>Attempt to summarize the literature systematically assessing the methodological quality of included studies.</td>
<td>Systematic review of literature</td>
<td>North America urban area: population and land use.</td>
<td>Evaluate studies from 5 databases between 1995 and 2013 linking at demographics.</td>
<td>Available research does not allow identification of ways that the physical environment influences adult weight status, after taking into account methodological quality.</td>
<td>Obesogenics of environment</td>
</tr>
<tr>
<td>Toro-Ramos, Pacy, Pe-Sunyer, Gallagher (2015). Body composition during fetal development and infancy through the age of 5 years.</td>
<td>Presents data from previously published studies on body composition.</td>
<td>Systematic review of literature</td>
<td>N/A</td>
<td>Describe body composition of children from infancy to 5 years.</td>
<td>N/A</td>
<td>Physiology of adiposity</td>
</tr>
<tr>
<td>Bompliving, Park, Gallo (2012). ‘Timing of adiposity rebound: A step toward preventing obesity’.</td>
<td>The purpose of this study was to identify the timing of AR for U.S. children using NHANES survey results</td>
<td>Meta data analysis: NHANES 1999-2008, used to identify the age of AR. Used a stratified multistate design.</td>
<td>NHANES 1999-2008, CDC, 2009b. Target population: low income groups of adolescents 12-19 years of age, persons over 65 years, African-American, and Mexican-American – to improve stability of statistical estimates for all groups.</td>
<td>Identify the timing of AR for U.S. children.</td>
<td>Gender and racial/ethnic differences in adiposity rebound can be and were identified at an early age. It is important to start prevention and intervention strategies in early childhood.</td>
<td>Differences in the timing of AR by gender and race/ethnicity need to be considered when planning early intervention efforts.</td>
</tr>
</tbody>
</table>
Adiposity’s Economic Burden

Increases in adiposity in the U.S. and other affluent countries are characterized by the amount of excess fat a person has that affects his/her health (Bergman et al., 2011; WHO, 2000). Ongoing assessment of the economic burden of adiposity is imperative as the obesity epidemic places increasing financial demands on our healthcare system.

With regard to prevalence, Ogden, et al. (2014) report that one-third of adults and 17% of youth in the U.S. are obese according to their Body Mass Index (BMI) (Ogden et al., 2012). If the concerns of childhood obesity do not include early diagnosis and intervention, the health care system will be faced with irreversible consequences (CDC, 2015). The effect of obesity on longevity will influence the rate that taxes are imposed and the potential soundness of the programs that use age as the entitlement criterion (Olshansky, Passaro, Hershov, Layden, Carnes, Brody, Hayflick, Butler, Allison, & Ludwig, 2005). There is a well-established association between rising rates of obesity and increased medical spending (Finkelstein, Trogdon, Cohen, & Dietz, 2009). Finkelstein, et al. (2009) reported that twenty three percent of the rising medical costs related to obesity were financed by Medicare and nineteen percent by Medicaid. With the increasing prevalence of obesity and its impact on state and government budgets, obesity prevention efforts will be a high priority (Trogdon, Finkelstein, Feagan, & Cohen, 2012).

In Table 2.2, several studies are cited that investigate the financial burden associated with adiposity, many of which project that obesity will continue to be a high priority problem area for decades to come. The predicted 2030 trends of health and economic consequences project that there will be 65 million more obese adults in the U.S., with an estimated medical cost between $48 and $66 billion dollars a year. It is also expected that by the year 2048, all American adults will be over-weight (BMI = \geq 25) or obese (BMI= \geq 30) (Wang, McPherson, Marsh, Gortmaker, & Brown, 2011. By 2050, it is estimated that the number of obese adults in the U.S. will have
increased by 65 million, and in the U.K. by 11 million. This rise will result in approximately seven million cases of diabetes, six million cases of heart disease and stroke, between 492,000–669,000 cases of cancer, and an estimated 26–55 million forgone quality adjusted life years in the U.S. and U.K., combined (Wang, McPherson, Marsh, Gortmaker, & Brown, 2011).

Table 2.2. Summary of studies of adiposity’s economic burden

<table>
<thead>
<tr>
<th>Author(s), year, title</th>
<th>Purpose</th>
<th>Study design</th>
<th>Sample</th>
<th>Objective</th>
<th>Findings</th>
<th>Gaps/Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ogburn, Passaro, Hersh, Layden, Carse, Brody, Hayflick, Butler, Allison, Ludwig (2005), ‘A potential decline in life expectancy in the United States in the 21st century’</td>
<td>Evaluate life expectancy changes bases on health of the population</td>
<td>Quantitative - Retrospective analysis of data retrieved from the complete life tables from the National Center for Health Statistics</td>
<td>Persons between 20 – 85 years of age who have BMIs of 17 – 45, from the Third National Health and Nutrition Examination Survey.</td>
<td>The probability of death age was calculated using specific calculations</td>
<td>In light of the obesity trends related to the health status of the US population the expected increase needs to be reconsidered.</td>
<td>Problem solving of healthcare and the consequences.</td>
</tr>
<tr>
<td>Finkelstein, Trudgen, Cohen, Diez (2009), ‘Annual Medical spending attributable to obesity: payer and service specific estimates’</td>
<td>To present updated estimates of the costs of obesity in the U.S.</td>
<td>Quantitative retrospective analysis of data retrieved from 1998 -2006 Medical Expenditure Panel Surveys (MEPS).</td>
<td>Data from adults age eighteen or older with data on BMI, excluding pregnant women.</td>
<td>-Four equation regression approach -Two part models: (inpatient/ outpatient) &amp; prescription drug spending for each of the two services.</td>
<td>Undeniable connection between the rising rates of obesity and rising medical spending.</td>
<td>Facts presented need to be addressed</td>
</tr>
<tr>
<td>Wang, McPherson, Marsh, Gortmaker, Brown (2011), ‘Health and economic burden of the projected obesity trends in the USA and UK’</td>
<td>To project the probable health and economic consequences of obesity over the next twenty years.</td>
<td>Systematic analysis of epidemiological studies from 199 countries, Systematic review of the economic burden of obesity worldwide.</td>
<td>NHANES population 1988 – 2008 US Census HSE 1993 -2008 UK census and projections</td>
<td>Identify health burden from obesity driven by diabetes, cardiovascular disease, and certain cancers.</td>
<td>It is not definite how the continuing trend will respond to changing world food prices, agricultural policy, or technology innovations in the next 5 or 10 years. It could all change the pessimistic economic outcome that this study predicts</td>
<td>Projection of future effects of obesity on economy.</td>
</tr>
<tr>
<td>Ogden, Carroll, Kit, Flegal (2012), ‘Prevalence of obesity and trend in body mass index among US children and adolescents, 1999-2010’</td>
<td>To present the estimates of obesity prevalence between 1999-2008 in the U.S.</td>
<td>Quantitative-Cross-sectional analysis of the representative sample (n=4111) from the National Health and Nutrition Examination Survey 2009 – 2010.</td>
<td>US child and adolescent population (birth – 19 years) with measured heights and weights from the National Health and Nutrition Examination Survey 2009 – 2010.</td>
<td>To present the most recent estimates of obesity in US children (birth – 19 years) and to investigate trends in obesity and BMI among children and adolescents 2009 - 2010.</td>
<td>In 2009 – 2010, the prevalence of childhood obesity and adolescents was 16.9%; this was not changed compared with 2007 – 2008.</td>
<td>Present facts to be used by researchers as they explore the obesity prevalence in the U.S.</td>
</tr>
<tr>
<td>Ogden, Carroll, Kit, Flegal (2014), ‘Prevalence of childhood and adult obesity in the US, 2011-2012’</td>
<td>To provide most recent estimates so that trends in childhood obesity can be reviewed and analyzed.</td>
<td>Cross-sectional analysis of the representative sample (n=9120) from the National Health and Nutrition Examination Survey 2011 – 2012. Analysis was conducted overall and across 5 periods (2003-2004/ 2005-2006/ 2007-2008, 2009-2010/2011-2012).</td>
<td>-Infants and toddler birth – 2 years ≥95% of CDC growth chart. -Children – adolescents age 2-19 years &gt; 95% -Adults BMI &gt; 30</td>
<td>To provide the most recent national estimates of childhood obesity, analyze trends in childhood obesity between 2003 -2012, and provide detailed obesity trend analyses among adults.</td>
<td>No significant changes in obesity in youth or adults between 2004-2004 and 2011-2012. Obesity prevalence remains high and thus it is important to continue surveillance</td>
<td>Present facts to be used by researchers as they explore childhood obesity in the US.</td>
</tr>
</tbody>
</table>

Childhood obesity

Extensive research has been conducted on obesity among children (see Table 2.3) largely due to the established connection between childhood adiposity and obesity in adulthood. Using
an international survey of six large and nationally representative cross-sectional growth studies, Cole, et al. (2000) identified the childhood BMI cutoff points that map to adult BMI points indicative of obesity. These findings provide a less arbitrary and more clinically-relevant measurement that is broadly generalizable to national and international populations. The relationship of risk factors such as high cholesterol, hypertension, and chronic diseases can be determined using the cutoff points that are markers for obesity and therefore identify the person’s disease risk (Cole, Bellizzi, Flegal, & Dietz, 2000). Research by Juonala et al. (2011) provides further evidence that obesity, as a co morbidity, is a high risk factors and predictor of an increased rate of death; however, the contribution of childhood BMI has still not been clearly established (Juonala, Costan, Magnussen, Berenson, Venn, Burns, Sabin, et al., 2011). The authors also explore whether non-obese adults may be able to reverse the adverse effects of childhood obesity or whether childhood obesity increases cardiovascular risk independently of the adult BMI.

Further, there is increasing evidence on the relationship between childhood obesity and premature mortality and physical morbidity in adulthood (Reilly, Callaghan, Donaghey, & Hammed, 2011). Short-term effects of childhood obesity may be as significant as those in the long-term but are often viewed as less important. Prevention and treatment interventions might prevent the long-term effects and need to be further researched (Reilly & Kelly, 2011).

There is substantial evidence of the association between obesity and cardiovascular disease. Utilizing data from four large studies of cardiovascular risk factors among children (at baseline), Juonala, et al. (2011) tested whether a change from obesity in childhood to non-obesity in adulthood is associated with a reduced risk for diabetes type II, hypertension, and dyslipidemia. They found that a child with a normal BMI in childhood who became obese as an adult met the
cardiovascular risk-factor profile; and those that became non-obese as adults had a cardiovascular risk-factor profile the same as a person who was never obese.

Research by Yusuf, Hawkin, and Ounpuu (2005) established an association between central fat distribution and adult obesity-related comorbidities and mortality (Yusuf, Hawkin, & Ounpuu, 2005). The metabolic impact of fat mass and fat distribution in children suggests that risk factors identified in childhood are predictive of those that can be tracked into adulthood (Bigornia, LaVally, Benfield, Ness, & Newby, 2013). According to Bigornia, et al. (2013), atherosclerotic lesions found in children are directly related to cardiovascular disease; this discovery led to further research on central and total adiposity measures related to metabolic outcomes.

The association between demographic characteristics and obesity have been studied extensively; family, age, gender, and race/ethnicity have both independent and interrelated effects on obesity (Tuan, Butte, & Wang, 2012). Using the NHANES 2001-2004 database, Tuan, Butte, & Wang (2012) investigated the association between adiposity and age, gender, and race/ethnicity and SES in a statistical analysis that used accounted for design effects and sampling weight to represent the 40 million U.S. children and adolescents. The results showed that Mexican children had higher adiposity than white children (36% versus 26%, respectively; P<0.10), and significantly higher adiposity as compared to black children (36% versus 21%, respectively; P<0.05).
Table 2.3. Summary of studies of childhood obesity

<table>
<thead>
<tr>
<th>Author(s), year, title</th>
<th>Purpose</th>
<th>Study design</th>
<th>Sample</th>
<th>Objective</th>
<th>Findings</th>
<th>Gaps/Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cole, Bellizzi, Flegal, Dietz, (2000). 'Establishing a standard definition for child overweight and obesity worldwide: international survey'.</td>
<td>To develop an internationally acceptable definition of child overweight and obesity cut off points</td>
<td>International survey of six large nationally representative cross sectional growth studies (Brazil, Great Britain, Hong Kong, the Netherlands, Singapore, and the United States).</td>
<td>97.8% males and 94.8% females from birth to 25 years of age.</td>
<td>To develop international definition of child obesity.</td>
<td>Centile curves were drawn that at 18yrs passed through the widely used cut off points of 25 and 30 for adult overweight and obesity. The resulting curves were averaged to provide age and sex specific cut off points from 2-18yrs.</td>
<td>The health effects of BMI &lt;17 or 18.5 kg has not been studied in its relation to health risks.</td>
</tr>
<tr>
<td>Jouala, Cusson, Magnusson, Bremenson, et al. (2011). 'Childhood adiposity, adult adiposity, cardiovascular risk factors'.</td>
<td>To determine if childhood obesity is a predictor of increased risk of cardiovascular disease.</td>
<td>Analysis of study cohorts from four large studies.</td>
<td>*Bogalusa heart Study (US) *Moscatine study (US) *The Childhood Determinants of Adult Health (Australia). *The Cardiovascular Risk in Young Finns Study (Finland)</td>
<td>Explore the relationship between obesity and risk factors of cardiovascular disease</td>
<td>There is a relationship between obesity and adverse long term outcomes</td>
<td>There were differences between cohorts that did not allow complete connection across cohorts with respect to variables (puberty and socioeconomic status)</td>
</tr>
<tr>
<td>Bigounis, LaValley, Benfield, Nessa, Newby (2013). 'Relationships between direct and indirect measures of central and total adiposity in children: What are we measuring?'.</td>
<td>To study the relationship between direct (TBFM) and total fat measured (TBFM) by anthropometry, dual energy X-ray absorptiometry, and magnetic resonance imaging (MRI) with each other and systolic blood pressure.</td>
<td>Longitudinal study of parents and children were examined at ages 9, 11, 13, and 15 years (n=3,796) and 13 years (n=95).</td>
<td>The Avon Longitudinal study of parents and children (ALSPAC) population based prospective cohort examining environmental effect on the health and development of children.</td>
<td>To examine the relationships between measures of central and total adiposity obtained by anthropometry, DXA, and MBII (11 and 13 years only) in children 9, 11, and 15 years old. To compare to association with a clinical meaningful risk factor (SBP).</td>
<td>Waist circumference and BMI strongly correlated from 9-15 years of age. Similar findings with anthropometric measures and directly assessed total fat and intra-abdominal adipose tissue and SBP.</td>
<td>These findings should be considered in future research of central obesity in children as they suggest that WC as well as TFM can be measures of total adiposity. Need to consider metabolic effects of both central and total adiposity in children.</td>
</tr>
<tr>
<td>Reilly, and Kelly (2011). 'Long term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: systematic review'.</td>
<td>To summarize evidence on the long term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood</td>
<td>Systematic review of literature 2002-2010.</td>
<td>Cohort studies ranged in size from a sample of 4,857 to 1,024,000, with a median n = 45,920. Cohorts were from the U.S. and Western Europe.</td>
<td>To review evidence on the long term impact of overweight and obesity in childhood on morbidity and premature mortality in adulthood</td>
<td>A large and consistent body of evidence now demonstrates that overweight and obesity in childhood have adverse effects on pre-mature mortality and physical morbidity in adulthood.</td>
<td>That the short term effects can be as devastating as long term but may be seen as less important. Prevention and treatment interventions might prevent the long term...and need to be further researched.</td>
</tr>
<tr>
<td>Tuan, Butte, Wang (2012). 'Demographic and socioeconomic correlates of adiposity assessed with dual-energy X-ray absorptiometry in U.S. Children and adolescents'.</td>
<td>To determine if there is a connection between demographic-socioeconomic characteristics and adiposity measured by dual energy X-ray absorptiometry in U.S. children (DXA)</td>
<td>Used-specific linear and multinomial logistic regression models adjusted for demographic-socioeconomic factors.</td>
<td>Data from 8-19 year old U.S. children enrolled in NHANES 2001-2004. (n = 5,436).</td>
<td>To determine if there is a connection between demographic-socioeconomic characteristics and adiposity measured by dual energy X-ray absorptiometry in U.S. children (DXA)</td>
<td>Racial-ethnic disparities in adiposity persisted (p&lt; 0.01) after control for demographic-socioeconomic factors available in NHANES. The R² for sex specific models of “body fat or fat mass index (BMI)” regressed on age, race-ethnicity, family income, household size and birthplace ranged from 2% to 11%. The association among U.S. children varied considerably by age, sex, race-ethnicity.</td>
<td>Using NHANES the study only accounted for a small proportion of the variations in adiposity among U.S. children.</td>
</tr>
</tbody>
</table>
Effects of genetics, epigenetics, and culture on obesity

The effects of genetics, epigenetics, and environment on obesity have been explored in studies coined as ‘obesogenics’ for decades. (See summary in Table 2.4.) Genetic and epigenetic differences are important factors that relate to innate and instinctive eating behaviors of children, which may lead to weight gain and obesity later in life (Gardner, Sapienza, & Fisher, 2015). The findings of Gardner, Sapienza & Fisher (2015) provide evidence of the association between epigenetics and appetite among African American female children, taking into consideration the body composition differences between boys and girls. Hormonal changes were found to modify body composition, eating patterns, and the metabolism of carbohydrates, fats, and proteins in both genders. Research conducted by Gardner, et al. (2015) further support genetic predisposition to obesity; they found that obesogenic environments more strongly affected female African-American children than African-American male children, which suggests the need for additional research on genetic factors that may lead to obesity.

With the prevalence of diabetes higher among African Americans, Chandler-Laney, et al. (2010) conducted research to identify associations between adiposity and B-cell function and insulin sensitivity in African-Americans as compared to European-Americans. The research took into consideration that the association of adiposity and indexes of insulin sensitivity and B-cell function could differ by ethnicity and age (Chandler-Laney, Phadke, Granger, et al., 2010). The results suggested that the impact of adiposity on insulin secretion and action varies with ethnicity and, for reasons that are not clear, insulin sensitivity is lower among African-Americans vs European-Americans, even when independent of obesity (Chandler-Laney, Phadke, Granger, et al., 2010).
In a similar study conducted in England, Nightingale, Rudnicka, Owen, et al. (2013) studied ethnic differences in type II diabetes originating before adulthood in South Asians and white Europeans. The role of adiposity in the development of type II diabetes among South Asians is complex, and it is well established that BMI underestimates adiposity and body fat levels in this group (Nightingale, Rudnicka, Owen, et al. 2013). Due to the higher BMI in South Asians than white European children, early interventions are an especially high priority in this population (Nightingale, Rudnicka, Owen, et al. 2013).

In a study of intra-familial correlates conducted by Polley, Spicer, Knight, & Hartley (2005), found that ninety percent of Native and African-American parents and grandparents in Oklahoma had BMIs > 25.0; they also found a strong correlation between the BMI of the caretaker and that of the child. Targeting this groups through obesity-prevention programs is a high-priority recommendation that can only succeed with the aid of culturally-competent practitioners that encourage necessary life-style modifications.

Table 2.4. Summary of effects of genetics, epigenetics, and culture on obesity

<table>
<thead>
<tr>
<th>Author(s), year, title</th>
<th>Purpose</th>
<th>Study design</th>
<th>Sample</th>
<th>Objective</th>
<th>Findings</th>
<th>Gaps/Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chandler-Laney, Phadke, Granger, et al. (2010)</td>
<td>To test the hypothesis that the association of adiposity with indexes of insulin sensitivity and β-cell function would differ with ethnicity and age.</td>
<td>Experimental design</td>
<td>Participants were 168 healthy African American (AA) and European American (EA) girls’ ages 7-12 years, 18-32 years, and 40-70 years. Approved by IRB University of Alabama at Birmingham Alabama.</td>
<td>To test the hypothesis that the association of adiposity with indexes of insulin sensitivity and β-cell function would differ with ethnicity and age.</td>
<td>To test the hypothesis that the association of adiposity with indexes of insulin secretion and action differs with age and ethnicity.</td>
<td>Results suggest that further studies are needed to determine whether adipocyte-derived factors such as Free Fatty Acids (FFA) or leptin mediate the inverse association between adiposity and β-cell function.</td>
</tr>
<tr>
<td>Nightingale, Rudnicka, Owen, Wells, Sattar, Cock, Whincup (2013)</td>
<td>Examine the associations among adiposity, insulin resistance, and glycemic markers in children of different ethnic origins.</td>
<td>Cross-sectional study</td>
<td>Subjects: 4,633 9-10 year olds predominantly South Asian (n=1,126), black African-Caribbean (n=1,176), and white European (n=1,109). All had homeostasis model assessments of insulin resistance (HOMA-IR), glycemic markers (HbA1c and fasting glucose).</td>
<td>To research the role of adiposity in the South Asian ethnicity with type II diabetes</td>
<td>All adiposity measures were positively associated with HOMA-IR in all ethnic groups but associations were stronger among south Asians when compared to black African-Caribbean, and white Europeans.</td>
<td>It concluded that early intervention in the South Asian group was a high priority.</td>
</tr>
</tbody>
</table>
Black African-Caribbean and White European origin

adiposity. (BMI, waist circumference, skinfold thickness and bio-impedance).

Polley, D., Spicer, M., Knight, A., Hartley, B. (2005). ‘Intra-familial correlates of overweight and obesity in African American and Native American grandparents, parents, and children in rural Oklahoma’. To describe ‘overweight’ in Native-American and African American three generational families and to secondly; examine the relationships among the persons’ BMI, television hour. Questionnaire administered to each subject. 32 questions on social economic, health, diet, and physical activity information. A 3 day, 24 hour food recall, a one month frequency questionnaire, anthropometric information, and family contact information. Convenience sample of 84 three-generation families from 10 sites in rural Oklahoma. 44 families were Native American. 40 families were African American. To describe ‘overweight’ in Native-American and African American three generational families and to secondly; examine the relationships among the persons’ BMI, television hours and activity levels. Ninety percent of parents and grandparents had BMI >25.0. Correlations were observed between parent and child BMI, television activity with children's TV hours. Dietary professionals should plan family-friendly daily activities, like walking, healthy diets for both children and caretakers using culturally competent approaches.

Mother’s perception of adiposity in their children

Perception of appropriate weight and fat distribution vary by culture. For example, cultural differences exist between the perceptions of the European-American population and those of minorities concerning the best weight for their children (Killion, Hughes, Wendt, Pease, & Nicklas, 2006). Mareno (2013) constructed a definition of ‘parental perception of child weight’ with data collected from 2000-2012. Based upon the data, the following terms and concepts were determined to be integral to the definition: perception(s), awareness, discrimination, recognition, parent, weight, child, over-weight, and obesity (Mareno, 2013). A literature search of articles with these keywords and removal of those that did not meet inclusion criteria yielded a sample of 58 articles that met inclusion criteria, 47 of which were quantitative and 9 qualitative. Data were analyzed using a thematic approach that identified the key attributes of the concepts explored. From this concept analysis, parental perception of child’s weight was conceptually defined. Perception of a parent was defined as “a parent’s judgement of the child’s body weight formulated by the parent’s recognition of body size, physical appearance, functional abilities, psychosocial and health effects related to current body weight” (Mareno, 2013).

Parental perceptions are important (see Table 2.6) because they determine the health actions the parent will take on behalf of their children (Mareno, 2013). Studies by Alexander,
Sherman, Clarke (1991) and Kramer, Barr, Leduc, et al. (1983) involving Canadian and Mexican-American mothers found that adiposity in early childhood may have more to do with parental weight preference for their children than other factors. Exploring further, Rosas, Harley, Guendelman, et al. (2010) discussed reasons that Mexican mothers avoid labeling their children as ‘overweight’. Due to the prevalence of obesity in Mexican immigrant communities, weight norms are shifting. In addition, cultural norms play a role in identifying the ideal weight for young children; some parents prefer a larger body type which may prevent them from labeling their child as ‘overweight’ despite clinical designation as such.

Anthropological investigations reveal that Mexican parents perceive ‘chubby children as healthy children’ (Brewis, 2003). Using the Collins Scale, Rosas et al. (2010) assessed mothers’ perception of their children’s weight. They were asked to select the figure that best corresponded to their child’s appearance, as well as to select the ideal figure for the child. Parental selections were evaluated for significant patterns (see Figure 2.1). Mexican mothers, whether having immigrated to the U.S. or currently living in Mexico, frequently underestimated their child’s size. One-third of those living in the U.S. and one-half of the mothers living in Mexico wanted their child to be bigger than they perceived them. These anthropological and cultural differences in perception affect the health education models chosen to prevent or reduce obesity in Mexican children (Rosas, Harley, Guendelman, et al. 2010).
Lopes, Santos, Pereira, and Lopes (2012) conducted a study on parental perception of child weight in Portugal, the country with the highest level of childhood obesity in Europe. The results of their research indicated a high rate of maternal misclassification of child weight: 65% of underweight and 62% of overweight/obese children were inaccurately labeled by the mothers as being of normal weight. The actual weight that was measured and the mothers’ perception of the child‘s weight was seen as reasonable, but statistically significant. Findings were consistent with other studies that show that most parents do not correctly recognize their child’s weight status.

Another study was conducted among African-American mother-child dyads in two clinics containing the offices of the Special Supplemental Nutrition Program for women, infants, and children (WIC) (Boyington, Johnson, 2004). A sample of 105 post-partum African-American clients were recruited for a nine-month prospective study. Of those lost to follow up, complete data was collected on 54 mother-child dyads. Each child was followed from birth at regular intervals until they were six to seven months old (Boyington, & Johnson, 2004). Multiple questionnaires and scales were administered to the mothers to assess their perception of the infant as he/she grew for the first six months (see Table 2.5). Boyington and Johnson’s (2004) research
confirmed that maternal perception of infants’ body size affected feeding decisions based on factors that were not always related to nutrition.

Table 2.5. Questionnaire and scales (adapted from Boyington & Johnson research, 2004).

<table>
<thead>
<tr>
<th>Scales</th>
<th>Description of variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social demographic Questionnaire (SDQ)</td>
<td>- First administered and contained: maternal age, parity, marital status, education, family income, number of household residents, and use of social services (such as WIC)</td>
</tr>
<tr>
<td>African-American Infant Body Habitus (AAIBHS)</td>
<td>- Secondly administered: visual assessment of African-American infant body habitus (See Figure 2.1).</td>
</tr>
<tr>
<td>Maternal Infant Feeding Practice Attitude Questionnaire (MIFAQ).</td>
<td>- In addition to these questionnaires a food frequency questionnaire was administered at the first and subsequent meetings with the mothers.</td>
</tr>
<tr>
<td>Maternal Infant Feeding Practice Questionnaires (MIFAQ).</td>
<td></td>
</tr>
<tr>
<td>Body Parts Ranking Scale (BPRS).</td>
<td>- Administered to determine importance of fat on particular body part (arms, legs, face, thighs, buttocks, and stomach).</td>
</tr>
</tbody>
</table>

Figure 2.2. African-American Infant Body Habitus Scale (AAIBHS) (images drawn by J. Boyington, 2004).
Thirty one percent of infants had BMI's $\geq 95^{th}$ percentile, and a combined 40% were above the $85^{th}$ percentile according to National Center of Health Statistics (NCHS) weight for height standards (Boyington, & Johnson, 2004). Moreover, compared to women of normal weight, overweight mothers were twice as likely to underestimate the body size of their infants using the AAIBHS scale, even when their infants were overweight (Boyington, & Johnson, 2004).

Table 2.6. Summary of studies of mothers’ perception of adiposity in their children

<table>
<thead>
<tr>
<th>Author (s), year, title</th>
<th>Purpose</th>
<th>Study design</th>
<th>Sample</th>
<th>Objective</th>
<th>Findings</th>
<th>Gaps/Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Killon, Hughes, Wenzl, Pease, Nicklas (2005). 'Minority mothers’ perceptions of children’s body size'.</td>
<td>To investigate minority mothers' misperceptions of their children's body size.</td>
<td>Figure Silhouettes with BMI estimated for each figure</td>
<td>Minority mothers with children enrolled in ten Head Start centers (n=192) ages 3-5 years old.</td>
<td>To investigate African-American and Hispanic mothers' perceptions of their children's body size using a scale with child figure silhouettes and compare those perceptions with their child's actual body mass index.</td>
<td>Significant differences were found between mothers' perception of their children's body size. Significant chi-square analysis, $\chi^2 &gt;7.13$, p=0.008 - suggesting differences in the mothers' perception.</td>
<td>Continued research is necessary in this group of minority mothers.</td>
</tr>
<tr>
<td>Boyington, A., Johnson, A. (2004). Maternal perception of body size as a determinant of infant adiposity in an African – American community.</td>
<td>Explore the associations between maternal perceptions of infant body size perceptions.</td>
<td>A nine-month prospective study. (Using questionnaires, silhouette, and ranking scales). 105 postpartum African-American clients of three inner cities clinics were recruited for this nine-month prospective study. 54 mother-infant dyads were used.</td>
<td>Explore the associations between maternal perceptions of infant body size perceptions.</td>
<td>Maternal perception of infant body size was positively correlated with early introduction of non-milk foods. Earlier the introduction of non-milk foods, the greater the infants BMI at 6 to 7 months.</td>
<td>It was observed that compared to women of normal weight, overweight mothers were twice as likely to underestimate the body size of their infants using the AAIBHS scale.</td>
<td></td>
</tr>
<tr>
<td>Moreno, N. (2013). Parental perception of child weight: a concept analysis.</td>
<td>The article is a report of an analysis of the concept of parental perception of child weight.</td>
<td>Rodgers’s evolutionary view of concept analysis guided this inquiry.</td>
<td>N/A</td>
<td>Data from 2000-2012 related to the concept of interest were reviewed. 58 articles met inclusion criteria. Key attributes of the concept were identified. Common themes related to the concept were revealed.</td>
<td>Five attributes were identified: parental beliefs and values about body weight, fatalism, societal normalization of overweight, parental weight status and parental mental health status.</td>
<td>Parents who recognize child weight issues may be motivated to initiate lifestyle changes, resulting in a healthy weight for the child.</td>
</tr>
<tr>
<td>Lopes, Santos, Pereira and Lopes (2012). Maternal perceptions of children's weight status.</td>
<td>Aim was to quantify maternal misclassification of child weight status.</td>
<td>School-based study from the school year 2009/2010 in northern Portugal with 499 urban children (236 girls, 47.3%). BMI was used with questionnaire addressing mothers' perception and child's demographics from school records.</td>
<td>Sample was of Portuguese children ages 9 - 12 years, according to gender, family income, and maternal weight status, education level and age.</td>
<td>To quantify maternal misclassification of child weight status.</td>
<td>Using Cohen's Kapa for analysis the measured weight status was examined to the mother's perception of their child’s weight status.</td>
<td>Many mothers do not properly recognize their children’s weight status and frequently underestimate their children’s body size.</td>
</tr>
<tr>
<td>Rosa, L., Harley, K., Gueuderman, S., Fernald, Mejia, P., Eskozi, B. (2010). ‘Maternal perception of child weight among Mexicans in California and Mexico’.</td>
<td>The goal of this study was to examine and compare mother’s perception of weight in Mexico and in an immigrant community in California.</td>
<td>Two cross-sectional samples: the children were from the Center for the Health Assessment of Mothers and Children of Salinas study (CHAMACOS); which was a longitudinal birth cohort of pregnant women living in Salinas Valley (low income, Spanish speaking)</td>
<td>Mother were chosen of 5 year old children from the CHAMACOS cohort study.</td>
<td>To examine and compare mother’s perception of weight in Mexico and in an immigrant community in California.</td>
<td>This study generated how a mother’s perception may be influenced by migration. In this binational study it was noted that immigrant mothers were more likely to underestimate their children’s weight than the mothers in Mexico.</td>
<td>Besides what is stated in the findings this study showed that approximately one third of Mexican mothers residing in the U.S. and Mexico underestimate their child’s size and one half of all mother’s wanted the children to be bigger than they were currently perceived.</td>
</tr>
</tbody>
</table>
Body measurement of adiposity in children

Obesity, particularly childhood obesity, is one of the most serious problems afflicting our society (see Table 2.7). Research conducted by Shibli, Rubin, Akons & Shaoul (2008) determined that the high rate of hospital admissions for infants of ≥ 95th percentile is correlated with increasing rates of respiratory morbidity, snoring, and delayed motor skills. These findings underscore the importance of increasing parent awareness in being able to identify and adhere to normal weights in their children (Shibli, Rubin, Akons & Shaoul, 2008).

Being able to accurately measure obesity and adiposity is the first step toward prevention and treatment. Dual-energy X-ray absorptiometry (DEXA) is most accurate method of identifying adiposity, however, in the clinical arena, BMI is typically used (see Table 1.4) (Kakinami, Henderson, Chiolero, Cole, & Pardis, 2013). BMI and adiposity change due to normal growth and it is unclear how the BMI measurement change acts as a measure of adiposity (Kakinami, Henderson, Chiolero, et al., 2013). Cross-sectionally, BMI percentile and z-scores correlate well with the DEXA, but the ability of DEXA to measure adiposity changes has been questioned. Moreover, with the limited accuracy of the BMI, there is a need for an alternate parameter (Bergman, Stefanovski, Buchanan, Sumner, Reynolds, Sebring, Xiang, & Watanabe, 2011; Kakinami, Henderson, Chiolero, et al., 2013). Several alternative techniques have been developed for determining adiposity or body fat. The tools include: waist circumference (WC), waist-to-hip ratio (WHR), waist-to-height ration (WHTR), skinfold thickness, dual energy X-ray absorption (DXA), and hydrostatic densitometry (Bennasar-Veney, Lopez-Gonzalez, Tauler, Cespedes, Vincente-Herrero, Yanez, Tomas-Sava, & Aguilo, 2013).

There can be errors in the anthropometric measurements between children of different ethnic groups, especially when determining the composition and distribution of body fat (Bennasar-Veney, Lopez-Gonzalez, Tauler, Cespedes, et al., 2013). The relationship between body fat and height is non-linear; using the BAI the percentage of body fat, the hip measurement is divided by height minus 18. The ability of the BAI to predict the percentage of adiposity in different ethnic groups was tested by Bergman, Stefanovski, Buchanan, et al. (2011) and
identified adiposity in two different ethnic groups. The BAI as an estimate of the percentage of body fat that does not need statistical correction for gender, requires no body weight, and is of no cost to the patient is invaluable. As such, the BAI may be a viable alternative to BMI.

### Table 2.7. Body measurement of adiposity in children

<table>
<thead>
<tr>
<th>Author (s), year, title</th>
<th>Purpose</th>
<th>Study design</th>
<th>Sample</th>
<th>Objective</th>
<th>Findings</th>
<th>Gaps/Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shibli, Rubin, Akins and Shaoel (2008). ‘Morbidity of overweight (≥85th percentile in the first two years of life’.</td>
<td>To assess the prevalence of overweight in a sample of hospitalized infants and to assess the prevalence of morbidity in overweight infants in a community based sample.</td>
<td>Community based sample. Using a structured questionnaire parents of children were interviewed for demographic material, nutrition, eating habits. ED visits admissions to the hospital, including follow up for developmental delays, respiratory issues… Control group random …normal weight for height infants.</td>
<td>Included 2139 infants &lt;24 months who were admitted for any reason to the hospital from 2004-2005. It was a community based sample.</td>
<td>The major objectives were to assess the prevalence of overweight in a sample of hospitalized infants and to assess the prevalence of morbidity in overweight infants in a community based sample.</td>
<td>Infants of ≥85th percentile had more admissions than expected and more repeat admissions</td>
<td>BMI is a good proxy for change in fat mass. However, BMI percentile and change in per cent mass perform less well and are not recommended.</td>
</tr>
<tr>
<td>Kaknani, Henderson, Choler, Cote, Paradis, (2014). ‘Identifying the best body mass index matrix to assess adiposity change in children’,</td>
<td>Explored which metrics of BMI change have the highest correlations with different metrics of DEXA change.</td>
<td>Data collection from Quebec Adipose and Lifestyle Investigation in Youth cohort 8-10 years of age.</td>
<td>Cohort 8-10 years of age from the Quebec Adipose and Lifestyle Investigation in Youth</td>
<td>Explored which metrics of BMI change have the highest correlations with different metrics of DEXA change</td>
<td>In 8-10 year olds per cent change in BMI is a good proxy for change in fat mass. However change in BMI percentile and change in fat mass are not recommended.</td>
<td>Change in BMI percentile and change in fat mass do not calculate well and are not recommended.</td>
</tr>
<tr>
<td>Bennasar-Veney, Lopez-Gonzalez, Tauler, Crespedes, et al. (2013). ‘Body adiposity index and cardiovascular health risk factors in Caucasians’.</td>
<td>To explore health risks associated with body fat.</td>
<td>Cross sectional study</td>
<td>Caucasian adult workers and belonged to different parts of Spain. Systematically selected using random numbers. 65.200 participants for the study</td>
<td>To explore health risks associated with body fat.</td>
<td>Felt that the BAI in adults does not overcome the limitations of BMI for measuring cardiovascular risk</td>
<td>Felt that the BAI in adults does not overcome the limitations of BMI for measuring cardiovascular risk.</td>
</tr>
<tr>
<td>Bergman, Stefanovski, Buchanan, et al. (2011). ‘A better index of body adiposity’.</td>
<td>Identify a specific trait that would correlate with the DXA for DMII. Find better tool than BMI for measuring adiposity.</td>
<td>Used the Beta Gene Study participants.</td>
<td>Beta Gene participants, 1,733 subjects were Mexican with parents that were diagnosed with diabetes</td>
<td>Identify a specific trait that would correlate with the DXA for DMII</td>
<td>BAI could be used in different ethnic groups.</td>
<td>BAI could identify genetic traits looking at adiposity in two ethnic groups.</td>
</tr>
</tbody>
</table>

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**Chapter Summary**

This chapter reviews the current literature on adiposity and obesity, mothers’ perceptions of their child’s body size, the impact of childhood obesity on health in adulthood, economics and trends in healthcare that relate to obesity, and the long term effects of obesity on African-Americans, as well as other cultures and sub-populations. It also reviews the literature on the different ways to measure adiposity and weight presently used by clinicians. This study validates
the use of a culturally sensitive silhouette scale that measures African-American mothers’
perception of their 2 to 4-year-old child’s body size. Further, the use of the BAI and a culturally
congruent silhouette to accurately identify the mother’s perception in this population is supported
by evidence from the following research areas: the physiology of adiposity; the economic cost of
obesity on global healthcare; effects of genetics, epigenetics, and culture on obesity; the mothers’
perception on child’s body size; and the body measurements of adiposity. The next chapter will
highlight the methodology used to develop and validate the study instrument.
Chapter 3. Methodology

Introduction

The primary objective of this research is to develop and validate a silhouette scale that measures African-American mothers’ perception of body size of their two to four year old children (classified as underweight, normal weight, and overweight), as detailed in Chapter 1. In this chapter, a discussion of the methodology used to test tool development, sampling, setting, procedures, data collection protocols, and planned statistical testing are discussed.

Scale Development

To develop a silhouette scale for this purpose, mothers of children between the ages of 2 years were recruited from local pediatric practices. The pool of children represented the selected age range, but varied by body size and race. The silhouettes were to be constructed by an artist. For this purpose, the artist was provided with two sources of information: photographs of the children, as well as their body measurements.

Photographs

a. Upon providing informed consent, mothers completed a self-administered questionnaire that obtained the following information: race of both parents; delivery information for child (gestational age, birth date, and birth weight); mother’s age, mother’s past medical history, the number of years the mother spent in school; and whether the family receives public assistance via Electronic Benefit Transfer card (EBT).

b. The mother undressed the child to a clean diaper or underwear. All photographs were taken by the principle investigator in the presence of the mother. Front, back and lateral view photographs were taken using a neutral back drop to eliminate any height reference.
c. All pictures were taken with a Nixon COOLPIX S7000 digital camera.

d. Faces were blocked out of all photographs so that the children are unidentifiable.

Measurements

a. Hips were measured in centimeters (cm) using a tape measure.

b. Weight was measured in kilograms (kg) using the same clinic beam scale.

c. Height was measured in centimeters (cm) using a beam scale.

All measurements were taken twice to ensure accuracy. The determination of underweight, normal weight, and overweight was accomplished using the Body Adiposity Index. Features associated with the body adiposity index (BAI) include age, height, and hip circumference. In addition, non-gender weight-for-height percentiles were calculated according to the World Health Organization (WHO) (2006) growth reference information for children and young adults between the ages of 5 to 19 years, as follows:

a. Overweight > + 1SD (equivalent to BMI 25kg/m² at 19 years)

b. Obesity > +2SD (equivalent to BMI 30kg/m² at 19 years)

c. Thinness: < -2SD

d. Severe thinness: < -3SD

Artist’s Instructions

The principle investigator reviewed photographs and created a list of features that needed to be included in drawings. The artist received fifteen individual packs that included three photographs, hip measurement, and length of each child to be represented by each of the 5 silhouettes (a total of 15 packets). The artist was asked to create 5 front view and 5 lateral view drawings ranging from the 1st to 100th percentile. The silhouettes were
intended to represent children between 2 and 4 years of age, have no identifiable gender characteristics, and be racially identifiable.

Table 3.1 Children’s Measurement

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>HEIGHT</th>
<th>WEIGHT</th>
<th>HIP Measurements</th>
<th>Body Adiposity Index (BAI)</th>
<th>CDC Perentile Calculator/Child</th>
<th>CDC Percentile Calculator/Child</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A (3B)</td>
<td>37 ½ inches</td>
<td>32 lbs.</td>
<td>20 ½ inches</td>
<td>36.43%</td>
<td>#2</td>
<td>15.8</td>
</tr>
<tr>
<td>2A (3B)</td>
<td>41 ¼ inches</td>
<td>41 ¾ lbs.</td>
<td>22 inches</td>
<td>32.69%</td>
<td>#3</td>
<td>16.6</td>
</tr>
<tr>
<td>3A (4G)</td>
<td>40 ½ inches</td>
<td>38 ¼ lbs.</td>
<td>22 inches</td>
<td>36.18%</td>
<td>#2</td>
<td>16.7</td>
</tr>
<tr>
<td>4A (4G)</td>
<td>42 inches</td>
<td>40 1/8 lbs.</td>
<td>22 ½ inches</td>
<td>33.50%</td>
<td>#2</td>
<td>16.7</td>
</tr>
<tr>
<td>5A (4B)</td>
<td>43 ½ inches</td>
<td>41 lbs.</td>
<td>21 inches</td>
<td>26.71%</td>
<td>#1</td>
<td>15.1</td>
</tr>
<tr>
<td>6A (3B)</td>
<td>37 ½ inches</td>
<td>30 lbs.</td>
<td>20 ½ inches</td>
<td>39.06%</td>
<td>#3</td>
<td>15.3</td>
</tr>
<tr>
<td>7A (2B)</td>
<td>34½ inches</td>
<td>29 ½ lbs.</td>
<td>20 inches</td>
<td>42.14%</td>
<td>#2</td>
<td>17.6</td>
</tr>
<tr>
<td>8A (3G)</td>
<td>42 inches</td>
<td>43 lbs.</td>
<td>22 ½ inches</td>
<td>33.50%</td>
<td>#2</td>
<td>17.1</td>
</tr>
<tr>
<td>9A (3G)</td>
<td>39 inches</td>
<td>37 lbs.</td>
<td>23 inches</td>
<td>40.88%</td>
<td>#1</td>
<td>17.1</td>
</tr>
<tr>
<td>10A (2G)</td>
<td>33 inches</td>
<td>29½ lbs.</td>
<td>18 ½ inches</td>
<td>17.90%</td>
<td>#2</td>
<td>19.2</td>
</tr>
<tr>
<td>11A (3B)</td>
<td>39 inches</td>
<td>37 ½ lbs.</td>
<td>23 inches</td>
<td>40.88%</td>
<td>#3</td>
<td>17.2</td>
</tr>
<tr>
<td>12A (2B)</td>
<td>34½ inches</td>
<td>30 ½ lbs.</td>
<td>19 ½ inches</td>
<td>41.55%</td>
<td>#3</td>
<td>17.9</td>
</tr>
<tr>
<td>13A (3G)</td>
<td>41¼ inches</td>
<td>37½ lbs.</td>
<td>23 inches</td>
<td>36.69%</td>
<td>#3</td>
<td>15.5</td>
</tr>
<tr>
<td>14A (4G)</td>
<td>45 ½ inches</td>
<td>50 lbs.</td>
<td>24 ½ inches</td>
<td>30.99%</td>
<td>#2</td>
<td>19.9</td>
</tr>
<tr>
<td>15A (2B)</td>
<td>33 ½ inches</td>
<td>35 lbs.</td>
<td>21 inches</td>
<td>40.81%</td>
<td>#2</td>
<td>22.3</td>
</tr>
</tbody>
</table>

Figure 3.1 Buckley Toddler Scale (Buckley, 2017)
Scale Validation

Scale validity was determined by:

1. two forms of content validity
2. assessment of the age, neutrality of gender, and race/ethnicity
3. inter and intra-rater reliability
4. concurrent validity (Table 3.1).

Content Validity

Content validity was assessed by the level of agreement with regard to the ordering and classification of the silhouettes by two expert groups and content validity questionnaires.

1. Expert groups included:
   a. Health professionals, who were graduate students recruited from pediatric nurse practitioner and family nurse practitioner programs.
   b. Mothers of children, who were recruited from primary care or pediatric practices.

2. A version of the content validity questionnaire was developed with the silhouettes in random order.
   a. The first request directed the experts to arrange the silhouettes from #1 to #5 according to their weight.
   b. Next, the experts wrote the word underweight, normal weight, or overweight under the corresponding silhouettes.
   c. Using SPSS statistical software, (SPSS, Chicago, IL.) analysis was performed using data obtained from the content validity questionnaire.
Assessment of Characteristics

Assessment of characteristics was performed by the same two expert groups described in the Content Validity section.

a. To validate these features of the silhouette, three questions were asked that related to the age range, neutrality of gender, and race:
   i. Does the child in the tool appear to be between the ages of two and four years old?
   ii. Is there any identification of gender in the appearance of the child in the tool?
   iii. Does the child look African American?

Inter and Intra-Rater Reliability

a. Consistency of ratings were examined by the same health professionals.

b. De-identified photos were matched to silhouettes (using duplicates) by health professionals.

c. Inter-rater reliability was assessed by choices between photos and silhouettes that correspond.

Concurrent Validity

a. Concurrent validity was assessed by determining whether experts would support the use of scale with physical exams for African American children.

b. Responses regarding the silhouette number placed with each photo were compared to the child’s BAI score and photo.
Table 3.2. Scale Validation

<table>
<thead>
<tr>
<th>Content Validity</th>
<th>Assessment of the characteristics</th>
<th>Inter and intra-rater reliability</th>
<th>Concurrent validity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content validity (experts) will be defined with agreement and classification of the silhouettes by two expert groups and content validity surveys</td>
<td>Assessment of the age, gender, race/ethnicity characteristics (practitioners and mothers)</td>
<td>Inter and intra-rater reliability</td>
<td>Concurrent validity (degree confirmed by other measure) which would support the use of scale with physical exams for African American children.</td>
</tr>
<tr>
<td>Two expert groups: Health professionals Mothers of children recruited</td>
<td>To validate the features of the silhouette three questions will be asked that relate to the age range, neutrality of gender and race/ethnicity.</td>
<td>Consistency of ratings by the same health professionals.</td>
<td>Responses regarding the silhouette number placed with each photo will be compared to the child’s BAI score.</td>
</tr>
<tr>
<td>Two forms: 1. Silhouettes in random order with request made to arrange them from smallest to heaviest. 2. Classify 5 silhouettes in order of weight. 3. SPSS analysis</td>
<td>De-identified photos will be matched to silhouettes (using duplicates) by health professionals</td>
<td>Inter-rater reliability will be assessed by choices between photos and silhouettes that correspond</td>
<td></td>
</tr>
</tbody>
</table>

Sample

The subjects were recruited by the PI with the help of staff from the local pediatric practices. All children were identified by their mother as African-American with the mother confirming that both of the child’s parents are African-American. The inclusion criteria and socio-cultural economic inclusion criteria for the children are described in Tables 3.3. and 3.4.

Table 3.3. Inclusion Criteria

| 1. All children will be between the ages of 2 and 4 years old. - No gender specified |
| 2. All children must speak English |
| 3. Children with mother’s that have had gestational diabetes or heart disease will be excluded. |
| 4. Children will not be included if either parent has diabetes mellitus type I or diabetes mellitus type II, hypothyroidism or hyperthyroidism, cancers, AIDS, gastro-enteropathies with malabsorption issues. |
| 5. All of the children will have been born between 36 and 40 weeks gestational age. |
| 6. All children will have been born weighing between 7.5 and 9 pounds. |
| 7. None of the children will have any diseases that are known to affect body composition or fat distribution or health (e.g., Cushing’s disease, Downs Syndrome, type 1 diabetes, Barraquer-Simons disease, gastroenteropathies, or food allergies). |
| 8. None of the children participating will be taking any medications that are known to affect body composition (e.g., growth hormone, methylphenidate). |
Table 3.4. Socio-cultural-Economic Inclusion Criteria

<table>
<thead>
<tr>
<th>Mother Parents self-identified as AA</th>
<th>Mother’s age at delivery</th>
<th>Parent’s Past MedHx</th>
<th>Child’s Past MedHx</th>
<th>Mother’s years in school</th>
<th>Family receive public assistance</th>
<th>Birthweight of child</th>
<th>Weeks at time of delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A AA</td>
<td>29</td>
<td>N</td>
<td>none</td>
<td>N</td>
<td>yes</td>
<td>NBW</td>
<td>40 weeks</td>
</tr>
<tr>
<td>2A AA</td>
<td>36</td>
<td>none</td>
<td>none</td>
<td>Master’s Degree</td>
<td>no</td>
<td>NBW</td>
<td>39</td>
</tr>
<tr>
<td>3A AA</td>
<td>33</td>
<td>none</td>
<td>none</td>
<td>HS</td>
<td>yes</td>
<td>NBW</td>
<td>37</td>
</tr>
<tr>
<td>4A AA</td>
<td>33</td>
<td>none</td>
<td>none</td>
<td>HS</td>
<td>yes</td>
<td>NBW</td>
<td>37</td>
</tr>
<tr>
<td>5A AA</td>
<td>50 (adopted parent)</td>
<td>none</td>
<td>none</td>
<td>Master’s Degree</td>
<td>no</td>
<td>6 lbs. 8oz</td>
<td>39</td>
</tr>
<tr>
<td>6A AA</td>
<td>34</td>
<td>none</td>
<td>none</td>
<td>14yrs</td>
<td>no</td>
<td>8 lbs.</td>
<td>39</td>
</tr>
<tr>
<td>7A N</td>
<td>N</td>
<td>N</td>
<td>none</td>
<td>N</td>
<td>N</td>
<td>NBW</td>
<td>40</td>
</tr>
<tr>
<td>8A AA</td>
<td>25</td>
<td>none</td>
<td>none</td>
<td>HS</td>
<td>yes</td>
<td>7 lbs. 1oz</td>
<td>39</td>
</tr>
<tr>
<td>9A AA</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>HS</td>
<td>no</td>
<td>9 lbs.</td>
<td>40</td>
</tr>
<tr>
<td>10A AA</td>
<td>33</td>
<td>none</td>
<td>none</td>
<td>18yrs</td>
<td>no</td>
<td>7 lbs.</td>
<td>38</td>
</tr>
<tr>
<td>11A N</td>
<td>N</td>
<td>N</td>
<td>none</td>
<td>N</td>
<td>N</td>
<td>NBW</td>
<td>40</td>
</tr>
<tr>
<td>12A AA</td>
<td>32</td>
<td>none</td>
<td>none</td>
<td>12yrs</td>
<td>N</td>
<td>NBW</td>
<td>40N</td>
</tr>
<tr>
<td>13A AA</td>
<td>44</td>
<td>none</td>
<td>none</td>
<td>Master’s degree</td>
<td>no</td>
<td>NBW</td>
<td>40</td>
</tr>
<tr>
<td>14A AA</td>
<td>24</td>
<td>none</td>
<td>none</td>
<td>14yrs</td>
<td>no</td>
<td>9 lbs. 9oz</td>
<td>40</td>
</tr>
<tr>
<td>15A AA</td>
<td>27</td>
<td>none</td>
<td>none</td>
<td>14yrs</td>
<td>no</td>
<td>8 lbs. 1oz</td>
<td>38</td>
</tr>
</tbody>
</table>

Legend:  
N = left blank;  
NBW = normal birth weight (7 – 9 lbs.);  
AA = African American;  
HS = high school

Setting

The study setting was a private pediatric practice that provided primary care to primarily Hispanic and African-American families that agreed to participate in the study.

Data Collection Procedure

Approval for the study was obtained from the Institutional Review Board at Lehmann College, CUNY, on which the investigator’s sponsor is a faculty member. Responsible conduct of research policies set forth by the investigator’s affiliation was followed, as were the permissions and policies in place at the data collection sites. The researcher completed training in responsible conduct of research through the collaborative institutional training initiative (CITI) before collecting data.
Potential sites were contacted via phone call, followed by an e-mail, introducing the study and the researcher. A brief description of the study was provided to interested institutions. Once a site showed interest in participating, the principal investigator met with staff, describing in detail the role of the principle investigator (PI) and the investigation process. Every interested institution or agency was given precisely the same information. All identifying information was removed from the child’s picture and all photographs were coded with a key. The codes were placed in a locked cabinet with access given only to the principal investigator.

In order to meet the objectives of the delimitations, the children’s charts were prescreened. All interactions with the children took place at well-child visits with the same registered nurse (RN) or PI doing all of the measurements and using the same equipment for every child. Mothers were asked prior to start of the visit by the PI whether they wished to participate. Each mother signed the informed consent form prior to any interactions with the child. Next, the child was undressed by the mother, allowing for measurements and photographs to be taken.

The steps for photographs were conducted in the same order for each child:

Step 1. The mother placed the child on the clinic scale and the child’s weight was measured and recorded by the PI. Weight was measured in kilograms (kg) twice to assure accuracy using the same clinic scale each time.

Step 2. The child continued to stand on the beam scale and the height was measured in centimeters (cm) twice using the beam scale.

Step 3. The hip measurement was taken when the child stepped off the scale and returned to a standing position next to the mother. Hips were measured in centimeters (cm) twice to assure accuracy using a tape measure.
**Step 4.** The mother was then asked to have the child place their feet on marked areas on the floor close to her and the PI took the three pictures using the Nikon COOLPIX S7000 in front of a prepared neutral back drop area.

**Step 5.** All photos were reviewed with the mother before the end of the visit.

**Step 6.** The PI monitored that all phases of the visit were complete and performed using the same measurement and documentation techniques.

**Data Analysis**

Using SPSS, version 24.0 (SPSS, Chicago, IL), content validity of the scale was assessed four ways. First, Cronbach’s Alpha was calculated which examined whether weight category ratings and silhouette ordering measured the same construct. Second, a Fisher’s exact test was calculated to determine whether there was a statistically significant association between scale ratings and weight category ratings. Third, a Kendall’s tau-b rank correlation coefficient was calculated to assess similarity between the ratings of the mother expert panel and the health care provider expert panel. Since the Buckley Toddler Scale is an ordinal scale, a Spearman’s rank correlation coefficient was calculated to assess concurrent validity between the PI’s scale ratings for each toddler participant’s photograph and their respective BAI percentage. Fourth, an intraclass correlation coefficient was calculated to assess the inter-rater reliability (consistency between raters) as well as the intra-rater reliability (consistency among individual raters) of the Buckley Toddler Scale in a panel of 20 health care experts.

**Silhouette Scale Development**

The major advantage of a visual analog scale is that it can be very sensitive (Mayer, 1978). This makes it useful in measuring a phenomenon that has subtle differences, such as adiposity levels in children. Visual analog scales have often been used as single-item measures
for which reliability can be determined only by the test retest method or by comparison with other measures of the same item (DeVellis, 2012).

A reliable instrument refers to one that performs in consistent and predictable ways (DeVellis, 2012). Its scores represent the true state of the variable being assessed and will not change unless there is an actual change in the variable. Because reliability is a necessary condition for validity, one can infer reliability if validity is evident. In this study, multiple visual analog items were developed so that internal consistency could be determined for the 5 silhouettes of African American children.

Age - All children recruited were between the ages of 2 and 4 years.

Hip Circumference - will vary with the different children

BAI = hip circumference/ height -18 – will be calculated by PI.

**Chapter Summary**

This chapter outlines the process to develop and validate the silhouette scale used to measure African-American mothers’ perception of their child’s body size. The topics presented included: scale development and validation, description of sample and study setting, development of the ‘Silhouette Scale’, data collection procedures, and the planned data analysis and statistical approach.
Chapter 4. Presentation and Analysis of Data

Introduction

This chapter presents a summary of the statistical results and findings of this study, presented in both narrative and tabled formats. Statistical analysis includes descriptive findings, evaluation by mothers and experts, scale validation, content validity, concurrent validity, and inter and intra-rater reliability of the Buckley Toddler Scale. Descriptive findings are described in Table 4.1. Tables 4.2 and 4.3 present data analysis of evaluations by the participating mothers and the panel of experts. Scale validation, including content validity assessment and sensitivity analysis, are presented in Tables 4.4 and 4.5. Rater evaluation agreement assessments and concurrent validity assessment are illustrated in Tables 4.6, 4.7 and 4.8. Tables 4.9 and 4.10 present analysis of inter and intra rater reliability.

Descriptive Characteristics of Mothers of Study Participants

To assess the concurrent validity and the inter-rater and intra-rater reliability of the Buckley Toddler Scale, the photographs of fifteen African-American toddlers were rated by expert raters (Nurse Practitioners) using the scale. The sociocultural and demographic characteristics of these children are outlined below in Table 4.1.

Table 4.1. Sociocultural demographic characteristics of the African-American mothers of the child study participants that were photographed.

<table>
<thead>
<tr>
<th>Mother ID</th>
<th>Race of Both Parents</th>
<th>Maternal Age at Delivery of Child (Years)</th>
<th>Any Maternal Medical History</th>
<th>Maternal Education Level</th>
<th>Mother Receives Public Assistance</th>
<th>Birth Weight of Child (Lbs.)</th>
<th>Gestation at Time of Delivery for Child (Weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>African-American</td>
<td>29</td>
<td>N/A</td>
<td>N/A</td>
<td>Yes</td>
<td>N/A</td>
<td>40</td>
</tr>
<tr>
<td>2A</td>
<td>African-American</td>
<td>36</td>
<td>No</td>
<td>Master’s Degree</td>
<td>No</td>
<td>N/A</td>
<td>39</td>
</tr>
<tr>
<td>3A</td>
<td>African-American</td>
<td>33</td>
<td>No</td>
<td>High School</td>
<td>Yes</td>
<td>N/A</td>
<td>37</td>
</tr>
<tr>
<td>4A</td>
<td>African-American</td>
<td>33</td>
<td>No</td>
<td>High School</td>
<td>Yes</td>
<td>N/A</td>
<td>37</td>
</tr>
<tr>
<td>5A</td>
<td>African-American</td>
<td>50</td>
<td>No</td>
<td>Master’s Degree</td>
<td>No</td>
<td>6.8</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>American</td>
<td></td>
<td>Degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----------</td>
<td>-------</td>
<td>--------</td>
<td>-------</td>
<td>-----</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>6A</td>
<td>African-American</td>
<td>34</td>
<td>No</td>
<td>Some College</td>
<td>No</td>
<td>8</td>
<td>39</td>
</tr>
<tr>
<td>7A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>8A</td>
<td>African-American</td>
<td>25</td>
<td>No</td>
<td>High School</td>
<td>Yes</td>
<td>7.1</td>
<td>39</td>
</tr>
<tr>
<td>9A</td>
<td>African-American</td>
<td>N</td>
<td>No</td>
<td>High School</td>
<td>No</td>
<td>9</td>
<td>40</td>
</tr>
<tr>
<td>10A</td>
<td>African-American</td>
<td>33</td>
<td>No</td>
<td>College Graduate</td>
<td>No</td>
<td>7</td>
<td>38</td>
</tr>
<tr>
<td>11A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>12A</td>
<td>African-American</td>
<td>32</td>
<td>No</td>
<td>High School</td>
<td>No</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>13A</td>
<td>African-American</td>
<td>44</td>
<td>No</td>
<td>Master’s Degree</td>
<td>No</td>
<td>N/A</td>
<td>40</td>
</tr>
<tr>
<td>14A</td>
<td>African-American</td>
<td>24</td>
<td>No</td>
<td>Some College</td>
<td>No</td>
<td>9.9</td>
<td>40</td>
</tr>
<tr>
<td>15A</td>
<td>African-American</td>
<td>27</td>
<td>No</td>
<td>Some College</td>
<td>No</td>
<td>8.1</td>
<td>38</td>
</tr>
</tbody>
</table>

As described in Table 4.1, all parents who participated in the study (n=13) identified as African-American. The mothers’ ages ranged from 24 to 50 years, and none reported a past medical history of diabetes, heart disease, or cancer. Over half (58.3%) of the mothers reported completing at least some college education. Approximately one-third (30.8%) of the mothers reported receiving public assistance. None of the eleven mothers who reported the gestational age of their child described the deliveries as being premature.

**Silhouette Appearance Evaluation by Expert Panels of Mothers and Health Care Providers**

The panel of 120 experts that assessed the reliability and validity of the Buckley Toddler Scale consisted of sixty Family Nurse Practitioners (FNPs) and sixty African American mothers of children between two and four years of age. Table 4.2 details the expert panel and lists individual ratings of the mothers when using the Buckley Toddler Scale. Table 4.3 lists the individual ratings of the second expert panel of FNPs who used the scale.
Table 4.2. Listing of individual expert Mother ‘Ratings’ for weight and visual appearance.

<table>
<thead>
<tr>
<th>Mother ID</th>
<th>Correctly Ordered Silhouettes in Using Buckley Toddler Scale</th>
<th>Correctly Rated Silhouettes by Weight Category</th>
<th>Rated Silhouettes in Tool as Age-Appropriate (Age 2-4)</th>
<th>Rated Silhouettes in Tool as Gender Neutral</th>
<th>Rated Silhouette in Tool as of African-American Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
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</table>
As displayed in Table 4.2, ninety-three (93.3%) percent of the mothers correctly placed the silhouettes in the Buckley Toddler Scale in numerical order (one to five), with one being the thinnest and five being the heaviest body type. About eighty-five (85%) percent of the mothers correctly labeled the toddlers in the scale by their respective weight category, using the terms underweight, normal weight, or overweight. Ninety-five (95%) percent of the mothers in the expert panel felt that the children in the scale appeared to be between two and four years old. Ninety-seven (96.7) percent said that the children in the tool looked African-American. Approximately two-thirds, or sixty-two percent (61.7%), of mothers felt that the children in the scale had no particular gender and could represent a boy or a girl.

Table 4.3. Listing of Individual Expert FNP Ratings for Weight and Visual Appearance

<table>
<thead>
<tr>
<th>Mother ID</th>
<th>Correctly Ordered Silhouettes in Using Buckley Toddler Scale</th>
<th>Correctly Rated Silhouettes by Weight Category</th>
<th>Rated Silhouettes in Tool as Age-Appropriate (Age 2-4)</th>
<th>Rated Silhouettes in Tool as Gender Neutral</th>
<th>Rated Silhouette in Tool as of African-American Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
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As detailed in Table 4.3, all FNPs in the expert panel correctly ordered the children from the scale in order and labeled all silhouettes in the Buckley Toddler Scale appropriately in terms of being underweight, normal weight, and overweight. Furthermore, they all indicated that the children appeared to be of toddler age, were of no particular gender, and looked African-American.

**Scale Validation**

**Content Validity Assessment**

In order to ensure that a scale adequately represents all aspects of a given construct, content validity must be sufficiently established. For this study, it was essential that the perceptions of the medical experts, as well as African-American mothers, were adequately captured and factored into scale utilization, specifically with regard to clinical weight categorization (underweight, normal weight, and overweight).

As outlined in the previous chapter, the content validity of the Buckley Toddler scale was assessed. First, by the evaluation of the value of Cronbach’s Alpha, which assesses the degree to
which two measures are measuring the same construct, and second, the p-value for the Fisher’s exact test, which is a small-cell alternative to the Chi-Square test of independence to examine whether there is an association between scale ratings and weight category ratings. The value of these statistical analyses for both the practitioner group ratings as well as the mother group ratings are displayed below in Table 4.4.

Table 4.4 Assessment of Association between Numeric Scale Ordering and Weight Category, a Rating of Scale Silhouettes

<table>
<thead>
<tr>
<th>Rater Group</th>
<th>Number of Matched Scale and Weight Category Rating</th>
<th>Cronbach’s Alpha</th>
<th>Fisher’s Exact Test P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mothers</td>
<td>50/60</td>
<td>0.593</td>
<td>0.009</td>
</tr>
<tr>
<td>Practitioners</td>
<td>60/60</td>
<td>b</td>
<td>b</td>
</tr>
</tbody>
</table>

a. Weight Category: Underweight, Normal Weight, Overweight
b. Not calculated by SPSS since there was perfect agreement for all expert raters (NPs) between the scale and weight category rating.

As displayed in Table 4.4, 83.3% of the mothers assigned the correct weight category rating (underweight, normal weight, overweight) and ordered the silhouettes of the scale correctly. There was perfect concordance or agreement between all 60 members of the Nurse Practitioner expert group for weight category ratings (underweight, normal weight, overweight) and the ordering of silhouettes using the scale. The Cronbach’s alpha for the mothers’ group was 0.593, which is slightly below the suggested minimum threshold of 0.70 in some literature. (Taakol, Dennick, 2011). The Fisher’s Exact test for the mothers’ group was statistically significant, suggesting that there is statistical relationship between the weight category rating scale and the numeric scale rating of the scale. Also, the perfect agreement in the ratings for the weight category scale and the numeric rating for the Buckley Toddler Scale suggest a robust content validity with the Nurse Practitioners group as the raters.

Another method of analysis to assess the content validity of the Buckley Toddler scale is the calculation of Kendall’s tau-b rank correlation coefficient which measures similarity between
the ratings of the mothers’ expert panel and the FNP’s expert panel. This particular type of correlation coefficient is a nonparametric alternative for paired data. However, as there were no incorrect ordering or labels for any of the photographs by all the expert raters (NPs), SPSS was unable to calculate Kendall’s tau-b rank correlation coefficient between the paired ratings of mothers and experts for numeric ratings and weight labels.

Sensitivity testing was performed by artificially imputing an incorrect rating for one of the experts (i.e., expert #6) for both the numeric ratings and weight labels (underweight, normal weight, overweight) for the purpose of conducting a correlation analysis. This individual was chosen because their newly imputed incorrect rating would not match the correct rating and labeling of mother #6 (with whom expert #6 was paired); so, the value of the Kendall’s tau-b rank correlation coefficient for this sensitivity analysis would be a slight underestimation of the true value. The results of this analysis are displayed in Table 4.5.

<table>
<thead>
<tr>
<th>Rating Type Between Mothers and Practitioners</th>
<th>Kendall’s tau-B Rank Correlation Coefficient</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correctly Ordered Silhouettes in Scale</td>
<td>-0.035</td>
<td>0.789</td>
</tr>
<tr>
<td>Correctly Labeled Photograph with Accurate Weight Category</td>
<td>-0.078</td>
<td>0.549</td>
</tr>
</tbody>
</table>

As shown in Table 4.5, the correlation coefficients for both rating types between mothers and practitioners did not achieve statistically significance, suggesting the absence of a correlation between the ratings of mothers and experts with regard to the ordering of silhouettes and weight categorization using the Buckley Toddler Scale. This outcome suggests a difference in perception of health care providers and mothers related to weight, as well as cultural relevance of medical images, such as the children size, ethnicity, and gender of the silhouettes in the Buckley Toddler Scale.
Assessment of Agreement between Ratings of Characteristics of Children in the Scale

In addition to assessing the size and weight of the silhouettes in the Buckley Toddler Scale, members of both expert panels assessed whether the artist’s renderings of the children appeared to be of toddler age (i.e., ages 2-4), were gender neutral images, (i.e., could be a male or female child), and appeared to be of African-American descent. The agreement between their ratings are displayed in Table 4.6.

Table 4.6. Percentage of Agreement in the Rating of the Characteristics of the Scale Silhouettes between Mother and Practitioner Expert Panels

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Percentage of Agreement of Ratings Between Mothers and Practitioners (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Appropriateness</td>
<td>95% (57/60)</td>
</tr>
<tr>
<td>Gender Neutral</td>
<td>61.7% (37/60)</td>
</tr>
<tr>
<td>African-American Descent</td>
<td>96.7% (58/60)</td>
</tr>
</tbody>
</table>

With regard to age appropriateness and racial appearance, the majority of mothers and practitioners agreed that the children in the scale looked to be of toddler age (95%) and of African-American decent (96.7%). However, while all of the practitioners agreed that the silhouettes in the scale appeared gender neutral, twenty-three (38.3%) of the mothers in the expert panel did not agree.

Concurrent Validity Assessment

Concurrent validity refers to the extent to which the results of a particular test, or measurement, correspond to those of a previously established measurement for the same construct. In order to assess the concurrent validity of the Buckley Toddler Scale, the numeric scale rating of each child by the Primary Investigator (JB) using the scale is compared to the body adiposity index (BAI) percentage of the child, which is considered to be a “gold standard.”
Establishing concurrent validity lends support to the use of the scale with physical exams for African-American children. Table 4.7 below details the BAI percentages and PI ratings of the photographs.

Table 4.7. Calculated Body Adiposity Index Percentage and PI Photo Ranking for Each Child

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>Body Adiposity Index (BAI)</th>
<th>Photo Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>36.43%</td>
<td>#2</td>
</tr>
<tr>
<td>2A</td>
<td>32.60%</td>
<td>#3</td>
</tr>
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<td>3A</td>
<td>36.36%</td>
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<td>5A</td>
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<td>6A</td>
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<td>7A</td>
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<td>9A</td>
<td>40.88%</td>
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<td>11A</td>
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<td>12A</td>
<td>41.55%</td>
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<td>13A</td>
<td>36.69%</td>
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<td>14A</td>
<td>30.99%</td>
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<tr>
<td>15A</td>
<td>50.84%</td>
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Since the Buckley Toddler Scale is an ordinal scale, a Spearman’s rank correlation coefficient was calculated in order to assess the concordance in ratings between the BAI percentage and the PI’s rating of study children’s photographs using the scale designed for this study. The value of the correlation coefficient as well as its p-value are presented in Table 4.8.

Table 4.8. Spearman’s Rank Correlation Coefficient and P-Value for the Association between BAI Percentage and the PI’s Rating of Child Photographs Using the Buckley Toddler Scale.

<table>
<thead>
<tr>
<th>Spearman’s Rank Correlation Coefficient</th>
<th>P-Value</th>
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<tr>
<td>0.243</td>
<td>0.383</td>
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The value of the correlation coefficient was 0.243 (p =0.383), indicating a weak correlation between the two variables which did not achieve statistical significance. Possible
reasons for the lack of significance include the small sample size, as well as the lack of variability in size of children used to assess the scale.

**Inter- and Intra-Rater Reliability**

In order to calculate the inter- and intra-rater reliability of the scale used in this study, a panel of twenty experts that included currently practicing family nurse practitioners (FNPs) were gathered to rate photographs of the children used for the design of the Buckley Toddler Scale. Specifically, twenty experts were recruited to rate twenty photographs of children that participated in this study. Of these twenty photographs, eight were duplicate photographs; specifically, the duplicate photograph pairs were #1 and #14, #2 and #13, #4 and #19, #6 and #17, #8 and #16, #10 and #15, #11 and #20, and, #12 and #18. The details of these ratings can be seen below in Table 4.9.

Table 4.9. Ratings of Child Photographs by Expert Panel of Family Nurse Practitioners

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</table>
Table 4.10. Analysis of Inter-Rater and Intra-Rater Reliability of Expert Raters Using the Buckley Toddler Scale to Assess Weight and Size of African-American Toddlers

<table>
<thead>
<tr>
<th>Reliability Measure</th>
<th>Intraclass Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inter-Rater Reliability (Between Individual Raters)</td>
<td>0.994</td>
</tr>
<tr>
<td>Intra-Rater Reliability (Between Ratings of Individuals)</td>
<td>0.994</td>
</tr>
</tbody>
</table>

The ICC measure of intra-rater reliability of the scale is 0.994, indicating nearly complete universal agreement between raters of individual photographs.

Regarding intra-rater reliability, the agreement between duplicate photographs was examined for all eight duplicate photograph pairs for each expert rater via intraclass correlation coefficient.
(ICC), and then combined in an average ICC. The value of this average ICC is 0.994, which suggests near perfect agreement of ratings within individual raters. A high ICC was expected for both the inter-rater and intra-rater reliability of the utilized scale, as only one rater had one different rating than all other raters.

Chapter Summary

This chapter includes a summary of the statistical analyses performed on the tool developed for the purpose of this study. Results are displayed in narrative and table format. The descriptive analysis offers a summary of the sample characteristics of the mother/child dyads, including the age of the mother; educational level of the mother; the ethnicity of both parents; the birth weight of the child and gestational age at delivery; and whether the family was receiving public assistance.

The reliability and validity of the silhouettes were assessed using one hundred and twenty experts: sixty Family Nurse Practitioners and sixty African-American mothers of children between two and four years old. The content validity was evaluated using Cronbach's Alpha to ensure that the construct of interest was being measured. The Fisher's exact test was used to assess the association between the scale ratings and weight categories ratings. The evaluation was completed using data obtained from both expert groups, the primary goal of which was to assess agreement between the two groups. Findings support the reliability and validity of the Buckley Toddler Scale development.

Chapter 5 presents a summary of the tool development. It contains an overview of the study, links the theoretical framework, the characteristics of the mother/child dyads, and an interpretation of study findings. Finally, it presents the strengths and limitations of the study, as well as recommendations and implications for clinical practice.
Chapter 5. Discussion

Introduction

This chapter provides a comprehensive overview of the study, the theoretical rationale that guided tool development, sample characteristics, interpretation of findings, and the strengths and limitations of the study. Additionally, the implications of study findings for nurses and other healthcare practitioners are discussed. Finally, recommendations for future research using the Buckley Toddler Scale are offered.

Overview of the Study

A comprehensive review of literature revealed that obesity is an epidemic in the US and worldwide. Approximately 50% of African Americans, the second largest ethnic group in the US, are obese according to Health and Human Services (2010). A disproportionate number of obese African-Americans develop chronic illnesses such as heart disease, diabetes, and cancer, which contribute to disability and premature death. The need to reverse the life-threatening consequences of obesity, particularly among this high-risk population, is critically evident (Go, Mozaffarian, Roger, Benjamin, Berry, Borden, & Turner, 2013; U.S. Census 2014; Purnell, 2014).

Childhood obesity is a known risk factor for obesity in adulthood, as well as numerous obesity-related chronic illnesses; this underscores the need to better understand parental assessment of child body size – thus providing the impetus for this study on the African-American mother’s perception of the body size of her two to four-year-old child. The findings of this study resulted in the conclusion that the Buckley Toddler Scale is a culturally competent assessment tool for this purpose.
Theoretical Rationale

Two theories guided the development of the Buckley Toddler Scale. First, Bandura’s (1986) Social Cognitive Theory (SCT) explains the cognitive, behavioral, and environmental factors that influence an individual’s decision making capability. In addition to strengthening a person’s belief in themselves and their ability to make appropriate choices, SCT explains the action of change that occurs because of these new skills and the capability of a person to set goals through self-motivation. Second, the metaparadigm of The Purnell Model for Cultural Competence (2000, 2002) organized within the framework of person, family, and community, supports the idea that the child does not stand alone and is defined in the context of the family and the broader arena of the community (Purnell, 2000). The cultural perspective and the bi-directionality among and between each of the domains allows for a holistic approach and flexibility with broad relevance for nurses in a diverse environment (Purnell, 2002). An understanding of those at high risk for obesity plays a significant role in the development and reversal of chronic diseases worldwide.

There is a need for culturally sensitive assessment tools in clinical medicine that account for heterogeneity among patients. Certain aspects from each of the theoretical models informed the development of the Buckley Toddler Scale with regard to factors that influence maternal-child observation (i.e., how mothers view their child’s body type). For example, do they see them as too thin, too heavy, or perfect, despite the actual weight and size of the child? The SCT supports that idea that a mother’s feelings about herself could result in changes in diet or lifestyle that improve the long-term health of the child. Purnell’s theory sheds light on familial and community factors that likely influence changes in behavior across several domains. Changes needed to correct unhealthy behaviors are motivated by a multitude of factors that influence a person’s perception of the value of the change needed.
Mother/Child Dyads Sample Characteristics

The participant pool for this study consisted of volunteer mothers and children attending well visits at a private pediatric practice in a large suburban population. Thirteen mother/child dyads were determined to have met strict inclusion criteria with no evidence of the criteria for exclusion.

All children included in the sample had a recorded gestational age of 37 to 40 weeks (full term) on the date of delivery and a recorded birth weight between 7.5 and 9 pounds, with two of the children weighing greater than 8lbs.13oz. One the day they were weighed, measured, and photographed, all children were between two and four years old. Both parents of the children self-identified as African-American. Mothers ranged in age from 24 to 50 years. More than half of the mothers reported receiving at least some college education. One-third of the mothers said that they received public assistance.

Mothers were excluded if they had documented diagnoses of gestational diabetes, heart disease, diabetes mellitus type I or type II, hypothyroidism, hyperthyroidism, cancer, AIDS, gastro-enteropathies, or malabsorption issues. Children were excluded if they had documented diagnoses of any diseases that are known to affect body composition or fat distribution (e.g., Cushing’s disease, Downs Syndrome, type 1 diabetes, Barraquer-Simons disease, gastro-enteropathies, or food allergies) or if they were prescribed medications that are known to affect body composition (e.g., growth hormone, methylphenidate).

The strict inclusion and exclusion criteria of the mother/child dyads were crucial to the study, and ensured the accuracy of the drawings and scale development. The dyads consisted of healthy mothers and healthy children to ensure that the scale would be useful when identifying specific characteristics of the child.
Interpretation of Findings

All participating mothers were interviewed and body measurements and photographs of the children were collected. An artist rendered drawings of children based upon the photographs and measurements of the children in the sample.

An expert panel consisting of sixty African American mothers (sample participants were not included) and sixty Family Nurse Practitioners rated the weight and body size on a scale from 1 to 5, (1 being the thinnest and five being the heaviest), based on the drawings rendered by the artist. The perceptions of 93% of the mothers accurately reflected body size ratings and 85% rated silhouettes in the scale applying accurate common weight terminology (underweight, normal weight, and overweight) to each silhouette. Ninety-five percent of the mothers reported that the children in the drawings looked to be between the ages of two and four years old, and two-thirds of the mothers (61.7%) felt the children appeared gender neutral (boy or girl). Additionally, 96.7% of the mothers felt the children looked African-American.

The ratings provided by the mothers were compared to those of the FNPs. All FNP experts (100%) reported accurate ratings of body size and accurately applied common weight terminology. Further, all FNPs (100%) indicated that the children portrayed in the drawings appeared to be between two and four years old, gender neutral, and African-American.

The content validity of the Buckley Scale was evaluated in several ways. Cronbach’s Alpha was used to assess the degree to which the two measures evaluate the same construct. A Fisher’s exact test was calculated to determine whether there exists a statistically significant association between scale ratings and weight category ratings. The results revealed 83% agreement between mothers and FNPs in accurately rating weight category and identifying
sequential order of the silhouettes. Perfect agreement (100%) between both groups was noted in the rating of the weight category and silhouettes.

The Cronbach’s Alpha score of the mother’ responses was 0.593, which was slightly lower than the suggested minimum threshold score of 0.70; yet, the p-value for the Fisher Exact test for the mothers’ responses (p =0.009) was statistically significant. A statistically significant relationship between the weight category rating scale and the numeric scale rating was noted. The agreement of the ratings by the FNPs for both weight and numeric ratings suggests robust content validity in the practitioners as raters.

Correlational analysis, to ensure sensitivity and validity of calculations, were conducted by artificially imputing an incorrect expert rating for both the numeric ratings and labels. Using this approach, the value of Kendall’s tau-b rank correlation coefficient for this sensitivity analysis is an underestimation of the true value, with both calculations not achieving statistical significance. This suggests that there is no correlation between how mothers and experts numerically rate the silhouettes of the children. This may also suggest a difference in perception of health care providers and mothers related to weight normalcy, as well as the cultural relevance of medical imagery and terminology. Further, the Spearman’s Rank Correlation showed a weak correlation between ranking of photos and the BAI percentage. Possible reasons for lack of correlation may include the small sample size and lack of variability in size of children. In sum, the FNPs saw the child objectively, while the mothers’ perceptions may have been influenced by factors that were more subjective.

To calculate the inter- and intra-rater reliability of the scale a panel of twenty experts was given access to photographs to be rated using the Buckley Toddler Scale. Agreement between ratings of each expert were considered and averaged using the intra-class correlation coefficient
(ICC). The ICC indicated a nearly complete universal agreement between the raters of the photographs.

In conclusion, analysis revealed that African-American mothers can look at drawings that resemble their children and be able to identify and describe their body size using common terminology. The study reveals that the Buckley Toddler Scale is an accurate tool to measure the African-American mother’s perception of their two to four year old child’s body size.

**Strengths of the tool development**

The strengths underlying the development of this assessment tool are the specific inclusion and exclusion criteria that describe the characteristics of the mother/child dyads. These criteria ensured consistency across participants which were central to the development of drawings used in the scale. Further, the use of the sixty African-American mothers as experts and sixty FNP students brought additional strength to the tool’s validity. The method of measurement in combination with photographs brought the ‘real’ African-American child into the tool. Providing photographs of African-American children, two to four years old, provided the artist with physical features that allowed the silhouettes to have the likeness of an African-American child.

The development of a visual analog scale was another strength. Visual analog scales are very sensitive to even the slightest changes; meaning, even slightly body size differences are noticeable on a child’s figure. Creating a visual analog scale to measure a mother’s perception of her child’s body is, in its simplicity, the most appropriate method to measure body size. Relying on a mother’s perception rather than education level or any other factor makes it not only accurate, but easy to use.
The Intraclass Correlation Coefficient (ICC), used to calculate the inter- and intra-rater reliability, showed nearly complete agreement among the twenty expert raters that were asked to look at the photographs taken of the children and label them using the toddler scale. Instrumental in collecting this appropriate group of children was that the pediatric practice where participants were recruited, had mainly African-American and Hispanic patients. This facilitated an appropriate collection of the needed photographs used to create the Buckley Toddler Scale.

**Weaknesses of the tool development**

The site selection was limited due to corporate control over many pediatric practices in the area. The PI was not permitted to use any hospitals, clinical practices associated with hospitals, or practices at which corporate-stakeholders were employed. There was no opportunity to collect data in any of the hospital clinics or private practices that had become incorporated.

Frequent cancellation of appointments prevents promotion of wellness, illness prevention, and patient education. For reasons outside of the PI’s control, data collection was delayed and took approximately nine months to complete. One explanation for the difficulty in recruiting the mother/child dyads could have been related to the mothers’ lack of education and/or lack of trust, as well as poor understanding of the need for well visits and preventative care.

**Implications for Nurses and Healthcare Practices**

It is the hope of the PI that the results of this study and the development of the Buckley Toddler Scale will encourage nurses and healthcare providers to assess the perceptions of mothers in their culturally comprehensive assessment of children and their families. Further, the study promotes the use of the Body Adiposity Index (BAI) while performing physical exams in addition to measuring Body Mass Index (BMI) as an inexpensive, easy to use method of measuring adipose tissue in children.
BMI, based on U.S. population figures, has been used to identify who is overweight or obese for decades (Rahman, & Berenson, 2010). BMI calculation is based upon height, weight, and amount of muscle mass, but it is not accurate for all body types (Cole, Bellizzi, Flegal, & Dietz, 2000). Its use in clinical practice is not accurate for measuring adiposity in individuals who fall outside of what is considered an ordinary body mass (Bergman, Stefanovski, Buchanan, Sumner, Reynolds, Sebring, Xiang, & Watanabe, 2011).

Conversely, Body Adiposity Index (BAI) is based upon the relationship of hip circumference and height, and calculates adiposity by measuring the amount of adipose tissue. BAI is a simple and inexpensive method that matches the accuracy of underwater weighing and DXA, according to Bergman et al. (2011). BAI has been used as a predictor of health outcomes in several studies and was used to develop and to validate the Buckley Toddler Scale.

This scale was developed to provide a culturally-sensitive approach to the management and diagnosis of obesity in children, as it known that ethnicity affects fat distribution (Greaves, et. al., 1989). The Buckley Toddler Scale is a tool that measures of the accuracy of mothers’ perceptions of size and weight of toddlers which can facilitate discussions of early identification and control of childhood obesity with nurses and other healthcare providers.

**Recommendations for Future Research**

Further research using the Buckley Toddler Scale should explore the effectiveness of the tool in a longitudinal study of children identified as a ‘at risk’ individual for obesity. Research to expand the application of the scale to include the development of other culturally competent tools depicting children from other ethnic groups (Hispanic, Asian, and Caucasian) is recommended.
Conclusions

This study led to the development and validation of a silhouette scale used to measure African-American mothers’ perception of their children in order to facilitate culturally-competent clinical assessment and identification of children at risk for obesity. Understanding parents’ perception of their children’s weight is an important point of reference when practicing preventative medicine; the ultimate goal of which is to slow or reverse the obesity epidemic. It is hoped that the Buckley Toddler Scale will provide an important piece of information that will ultimately help reduce the number of African-Americans with hypertension, hyperlipidemia, heart disease, and cancer.
Appendix A

THE CITY UNIVERSITY OF NEW YORK
THE GRADUATE CENTER
DEPARTMENT OF NURSING

CLINICAL INTEREST IN A RESEARCH STUDY

Title of Research Study: Development and validation of a silhouette scale to measure African-American mothers’ perception of the body size of their two to four-year-old children.

Principal Investigator: Joan Buckley PhDc, RN

Faculty Advisor: Chairperson Martha Whetsell PhD, RN, FAAN
School of Health Sciences, Human Services, & Nursing
T-3, Room 209
Phone: 718-960-8799

Campus Affiliation: Lehman College
250 Bedford Boulevard West, Bronx, NY, 10468

Introduction:

- My name is Joan Buckley and I am a registered nurse and doctoral student at the City University of New York Graduate Center.
- This letter is to request that your clinic/practice participate in a research study that explores the perception of an African American woman regarding the body size of their child between two and four years old.
- Involvement in the study is voluntary and the clinic/practice can choose to participate or not.
- Although the title of my dissertation describes the context of the study, I would be glad to arrange a meeting where I could explain the involvement of your staff, which is minimal, and answer any questions about the method of data collection.
- At that time, I will provide you with a full briefing, which will include an explanation of the purpose of the research and other information related to the research if you wish.
- You may ask questions at any time and I will be glad to explain further.
- At the end of the study you will again be provided with the results of the study and an opportunity to ask any questions you might have about those results.

Purpose:

- The purpose of this research study is to develop and validate a silhouette (visual analog) scale that will measure African American mothers’ perception of body size of their two to four year old children (underweight, normal, and overweight). This will help us to understand how the body size of a child can relate to their weight as they become adults, and how it affects their health.

Questions, Comments or Concerns:

- If you have any questions, comments or concerns about the research, I will explain in greater detail. If you have any questions after this meeting or clinic visit you can reach me via e-mail: Joan.Buckley@ncc.edu
- If you have questions about your rights as a research participant, or you have comments or concerns that you would like to discuss with someone other than the researchers, please call the CUNY Research Compliance Administrator at 646-664-8918. Alternately, you can write to:

CUNY Office of the Vice Chancellor for Research
Attn: Research Compliance Administrator

205 East 42nd Street

New York, NY 10017

**Signature of Clinical Representative:**

If you agree to participate in this research study, please sign and date below. You will be given a copy of this consent form to keep.

___________________________________________________                     ____________________________
Printed Name and title                                                       Date

____________________________________________
Signature                                                                             Date

Check box and provide e-mail address if interested in the results ____________________________
Appendix B

THE CITY UNIVERSITY OF NEW YORK
The Graduate Center
Department of Nursing

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Title of Research Study: Development and validation of a silhouette scale to measure African-American mothers’ perception of the body size of their two to four year old children.

Principal Investigator: Joan Buckley PhDc, RN

Faculty Advisor: Chairperson Martha Whetsell PhD, RN, FAAN
School of Health Sciences, Human Services, & Nursing
T-3, Room 209
Phone: 718-960-8799

Campus Affiliation: Lehman College
250 Bedford Boulevard West, Bronx, NY, 10468

Introduction/Script:

- My name is Joan Buckley and I am a registered nurse and doctoral student at the City University of New York Graduate Center.
- I am inviting you to participate in a research study because you have identified yourself as an African American woman with a child between two and four years old that meets the requirements that we are looking for in this study.
- Involvement in the study is voluntary and you can choose to participate or not.
- Although we will describe the tasks that you will be asked to perform with your child, and explain what the research is about, the full intent of the research will be explained to you after the study is completed.
- At that time, we will provide you with a full debriefing, which will include an explanation of the purpose of the research and other information related to the research.
- You may ask questions at any time and I will be glad to explain further.
- At the end of the study you will again be given an opportunity to ask any questions you might have about the results of the study.

Confidentiality section:

- You have the right to review the photographs of your child that will be taken as part of this research.
- To protect the child’s privacy, we have obtained a Certificate of Confidentiality from the National Institutes of Health. With this Certificate, the researchers cannot be forced by federal, state, or local courts to disclose information that may identify your child.

Purpose:

- The purpose of this research study is to develop and validate a silhouette (picture) scale that will measure African American mothers’ perception of body size of their two to four year old children (underweight, normal, and overweight). This will help us to understand how body size in a child relates to their weight as they become adults, and how it affects their health.

Future recruitment:
Signature of Participant section on the checklist below, please indicate if you would permit the researchers to contact you in the future for participation in other research studies.

____ I agree to allow the researchers to contact me for validation of silhouette tool.

____ I do not agree to allow the researchers to contact me for validation of silhouette tool.

**Procedures:** Instructions and explanations for mothers.

1. If you volunteer to participate in this research study, we will ask you to do the following at your child’s well visit in this clinic.
2. After signing the informed consent, you will be asked to fill out a questionnaire that includes questions regarding:
   - the race of both parents.
   - the delivery information of your child (age in weeks at birth, birth date & birth weight).
   - your age.
   - your past medical history.
   - your number of years in school.
   - do you receive public assistance via Electronic Benefit Transfer card (EBT).

   *(YOU MAY REFUSE TO ANSWER OR SKIP ANY QUESTION THAT YOU DO NOT WANT TO ANSWER.)*

3. As the mother you will be asked to undress the child for the physical exam to a clean diaper or underwear.
4. Measurements will be taken by the Principle Investigator (PI): (height, weight, and hip circumference) with you present.
5. Photographs will be taken by the PI in your presence. Front, back and side view photographs will be taken using a back ground that will give no height reference.
6. All pictures will be taken with the researcher’s Nikon COOLPIX S7000 digital camera.
7. All photographs will be cropped and a black bar will be placed over the eyes so that the child will be unidentifiable.

**Time Commitment:**

Your participation in this research study is expected to last for a total of 10 minutes.

**Potential Risks or Discomforts:**

Some of the questions the researcher are asking may be uncomfortable for you. If you do not wish to answer any of them, you can skip it and go to the next question.

**Potential Benefits:** You will not directly benefit from your participation in this research study.

**Payment for Participation:**

- You will not receive any payment for participating in this research study.

**Participants’ Rights:**

- **Your participation in this research study is voluntary.** You can decide to participate or not
- **You can decide to withdraw your consent and stop participating in the research at any time.**

**Questions, Comments or Concerns:**

- If you have any questions, comments or concerns about the research, I will explain in greater detail. If you have any questions after this meeting or clinic visit you can reach me via e-mail: Joan.Buckley@ncc.edu
- If you have questions about your rights as a research participant, or you have comments or concerns that you would like to discuss with someone other than the researchers, please call the CUNY Research Compliance Administrator at 646-664-8918. Alternately, you can write to:
CUNY Office of the Vice Chancellor for Research

Attn: Research Compliance Administrator

205 East 42nd Street

New York, NY 10017

**Signature of Participant:**

If you agree to participate in this research study, please sign and date below. You will be given a copy of this consent form to keep.

**Printed Name of Parent** ____________________________ **Date** ____________________________

**Signature of Parent** ____________________________ **Date** ____________________________

**Contact information (phone or e-mail)** ____________________________ **Date** ____________________________

**Printed Name of Individual Obtaining Consent** ____________________________

**Signature of Individual Obtaining Consent**

If you are requesting a copy of the research results please give e-mail address here ____________________________.
Appendix C

THE CITY UNIVERSITY OF NEW YORK
The Graduate Center
Department of Nursing
Demographic Questionnaire

Questions to be answered as accurately as possible:

1. What is the race both parents identify with? ____________________________________________.

2. Include the delivery information of your child (age in weeks at birth, birth date & birth weight) ____________________________________________.

3. Your age___________________________________________________.

4. Your past medical history______________________________________.

5. Your number of years in school__________________________________.

6. Do you receive public assistance via Electronic Benefit Transfer card (EBT) ____________________________________________________.

Thank you,

Joan Buckley
Appendix D

Permission Documents:

1. Social Cognitive Theory

The CUNY Graduate Center / Jbuckley

BJ

Buckley, Joan

Prof. Bandura, Thank you! Joan

AB

Albert Bandura <bandura@stanford.edu>

Today, 12:50 AM

Permission granted, AB

BJ

Buckley, Joan

Reply

Yesterday, 11:15 PM

bandura@stanford.edu

Dear Professor Bandura,

I am a doctoral student at the CUNY Graduate Center, NY, NY. I humbly ask your permission to use your Social Cognitive Theory in the development of a tool that would measure an African American mother's perception of her child's body size. I apologize for not asking sooner but I totally became engrossed in making the connection to another theorist and I apologize for that. I hope to hear positively from you soon. If I need to go to another person to get permission could you please direct me? Again, I appreciate you for all of the work that you have done.

Joan Buckley MS, GNP/ANP, RN
Chairperson Department of Nursing
Nassau Community College
Garden City, NY, 11530
516 572 9630


2. The Purnell Model

Buckley, Joan

---

Dear Dr. Purnell,

My name is Joan Buckley and I am a nursing PhD student at the Graduate Center in New York. I am working with Dr. Martha Whetsell as the chair of my committee.

Reading your work and more recently reviewing the literature on obesity and adiposity in African American children, I have been able to appreciate your model for its sensitivity in looking at who the person is and how the parents may feel when their child is identified as overweight.

My dissertation topic involves creating a tool that will accurately measure adiposity in African American toddlers and the plan for it is to be used by practitioners. Your model beautifully addresses the sensitive issues that surround the child and how important the practitioners role is in protecting the dignity of all involved.

I just wanted to let you know that I will be asking permission in the near future to use the model in my dissertation. I believe I will be following the guidelines presented in your book by FE. Davis. If you agree that I can use 'The Purnell model' than I will complete the process.

Hope to hear from you soon,

Regards,

Joan Buckley
Assistant Professor of Nursing
Nassau Community College,
Garden City, New York, 11530.

Larry Purnell <LPurnell@udel.edu>

---

Reply

Wed 2/24/2016, 6:26 PM
Buckley, Joan <Joan.Buckley@ncc.edu>

You absolutely can use my model for your dissertation. It is interesting that more doctoral students from South America use the model in their dissertations then in the US - or it may be possible more use it without asking permission.

I wish you a speedy success in your progression.

Larry Purnell, PhD, RN, FAAN
3. Center for Disease Control Statistics (CDC)

CDC INFO <cdcinfo@cdc.gov>

Reply
Fri 3/2/2018 7:17 PM
To: Buckley, Joan
You forwarded this message on 3/2/2018 8:14 PM

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  https://tools.cdc.gov

• The Public Media Health Library (PHIL) provides various media types for syndication including HTML, eCards, podcasts, widgets, infographics, pdfs, buttons, badges, and microsites:
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R.S.
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