CROSS-CULTURAL COMPARISON OF FACTORS INFLUENCING BODY MASS INDEX IN CZECH AND AMERICAN SCHOOL-AGED CHILDREN

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CHAPTER I

INTRODUCTION

Obesity among children has become a serious problem in the U.S. and other countries over the last several decades (World Health Organization (WHO), 2002). In the last 30 years, the rate of obesity among children has increased significantly and children are much heavier than in the past (Cole et al., 2000; Freedman et al., 1997). This alarming situation represents a public health problem that has many negative consequences on the health and nutritional status of both adults and children. Many studies have shown that overweight children are more likely to develop chronic diseases, such as type 2 diabetes, cardiovascular disease, and hypertension (United States Departments of Health and Human Services (USDHHS), 1998). Because most dietary behaviors are learned in childhood, overweight children are also more likely to become overweight or obese as adults (Kelder et al., 1994).

Previous research has identified several possible causes of obesity. For instance, several studies have indicated that American children consume large amounts of sweetened beverages, fast food, and low-nutrient dense foods that significantly contribute to their daily energy, fat, and saturated fat intakes (Paeratakul et al., 2003). In addition, children who consume more fast foods and sweets eat less fruits, vegetables and juices (Paeratakul et al., 2003). A study by Jahns et al. (2001) found that children snack more

often than they used to in the 1970's. Because children often chose energy-dense foods instead of fruits and vegetables for their snacks, this trend may be responsible for a 200-calorie increase in overall energy intake between 1977 and 1996 (Jahns et al., 2001). Physical inactivity and excessive television watching have also been linked to increased rates of obesity among children (Fontvieille et al., 1993).

In recent years, numerous interventions in the U.S. have been developed to reduce the alarming number of overweight children and children who are at risk for becoming overweight. Many studies have focused on decreasing children's energy and fat intakes, improving their fruit and vegetable intakes, and increasing their physical activity (Baranowski & Davis, 2000; Domel et al., 1993; Jamner et al., 2004; Caballero et al., 2003). However, despite these efforts, the number of children who are overweight or at risk for overweight in the U.S. continues to rise.

While the identification of possible causes of obesity, including fast food consumption and physical inactivity, has been very important for obesity-related research, researchers and nutrition professionals need to understand why children adopt these unhealthy behaviors. Therefore, in the last several years, researchers have shifted their focus to identifying the factors that directly influence children's dietary intakes and exercise behaviors. For instance, Cullen et al. (2002a) conducted a study that examined various social and environmental factors and their influence on children's fruit, juice and vegetable intakes in different ethnic groups in the U.S. Even though the subjects were exposed to similar environments, the study identified several interesting trends in the social and environmental influences between Euro-, African- and Hispanic American parents and children (Cullen et al., 2002a). For instance, the results indicated that

Mexican American parents were more likely to use a permissive parenting style than Euro-American parents. Interestingly, this parenting style was associated with lower fruit, juice and vegetable intakes among children in previous studies (Cullen et al., 2002a). The study also identified several other socio-environmental factors that were related to lower consumption of fruits, juices and vegetables among children (Cullen et al., 2002a). For instance, Hispanic-American parents reported significantly lower scores on meal planning and peer modeling scales than Euro-American parents (Cullen et al., 2002a). In addition, Euro- and African-American children reported higher peer modeling of fruits, juices and vegetables compared to Hispanic-American children. Because the study was conducted in the U.S. where children and parents live in a relatively homogenous environment, the authors suggested that future research should explore the differences and/or similarities in social and environmental factors that influence children's dietary intake in the U.S. and a country where children are exposed to different cultural values, food establishments, and other social and environmental influences (Cullen et al., 2002a).

A recent study showed that the prevalence of Body Mass Index for age (BMI-for-age) at or above the 85th percentile in children aged 13 to 15 was significantly higher in the U.S. compared to several European countries. By contrast, the Czech Republic was among the lowest prevalence of overweight or at risk for overweight among adolescents in the same study (Lissau et al., 2004). Despite the low nutrient density of the Czech traditional diet and a recent influx of negative dietary trends such as increased consumption of fast foods and soft drinks (WHO, 2001a; Filiberti et al., 1995;

Humenikova, 2003), there may be positive social and environmental factors that contribute to the lower prevalence of overweight children in the Czech Republic.

To our knowledge, none of the existing studies investigated the influence of social and environmental factors on children's BMI and dietary intakes between the U.S. and a country with lower obesity rates among children. By determining the differences in dietary intakes and physical activity, and by exploring some of the social and environmental factors between children from U.S. and Czech Republic, we can determine the factors that have positive impacts on children's BMI. The main purpose of this study was to compare a variety of factors that influence children's BMI among Czech and American school-aged children. More specifically, the study compared dietary intakes, type and amount of physical activity, frequency of fast food consumption, body image perceptions, parenting style, food socialization practices, food preparation and grocery shopping practices between children and parents in the U.S. and Czech Republic.

Significance of the Study

Despite extensive research on dietary intakes and physical activity among children, the number of overweight children in the U.S. is alarming. In fact, the child obesity rates in the U.S. are higher than many other countries (Lissau et al., 2004). While previous research has identified several dietary and exercise behaviors that contribute to obesity, social and environmental factors that influence these behaviors among children are not well understood. The results of this study contribute to the existing literature on obesity among children by identifying and comparing personal, social and environmental

factors between the U.S. and the Czech Republic, a country with lower obesity rates among children. Based on the findings of this study, nutrition professionals can design new nutrition interventions for American children that will focus on specific social and environmental influences that were found to be correlated with lower BMI-for-age, healthier dietary intakes and more physical activity among children.

Specific Aims

The goal of this study was to determine personal, social and environmental factors that influence BMI of children in the U.S. and the Czech Republic and to compare these factors between the two countries. The following are research questions that were addressed in the study: What are the personal, social, and environmental factors that influence children's BMI in the U.S. and the Czech Republic? How does the dietary intake of American children differ from the dietary intake of Czech children? Are there differences in the type and amount of physical activity between American and Czech children? Do American children have less positive perception of their bodies than Czech children? How do parental and environmental influences on children's BMI differ between the two countries?

The expected outcomes of the study were to:

- Determine differences in dietary intakes between American and Czech school-aged children in terms of energy, fat, percent energy derived from fat, fruit and vegetable servings and frequency of fast-food consumption.

- Identify whether the type and amount of physical activity among Czech children may be contributing to their lower BMI-for-age.
- Explore and identify differences/similarities in perceived body image and ideal body image among American and Czech children and parents.
- Determine what parental and environmental factors may be influencing children's BMI-for-age and compare them between American and Czech children.

Research Hypotheses

Hypothesis 1: Dietary intakes of American children are significantly higher in total energy, grams of fat and energy derived from fat compared to Czech children.

Hypotheses 2: American children consume less fruits and vegetables (in cups) than Czech children.

Hypothesis 3: American children dine more often in fast food restaurants than Czech children.

Hypothesis 4, 5 & 6: The ideal body image selected by American children is significantly smaller (thinner) than the ideal body image selected by Czech children. American children perceive themselves heavier compared to Czech children. There will be a significant difference in the ideal body image between American child-parent pair; no significant difference will be observed between Czech child-parent pairs.

Hypothesis 7: American children spend significantly less time (minutes) in moderate and vigorous-type physical activities compared to Czech children.

Hypothesis 8 & 9: American parents score lower on authoritative parenting scale compared to Czech parents. American parents are significantly less involved in their child's food/meal preparation than Czech parents.

Hypothesis 10: A lower amount of healthy foods are available in American households compared to Czech households.

Hypothesis 11: Children's BMI-for-age is significantly predicted by nationality (U.S. or Czech), parental BMI and education, children's energy and fat intakes; fruit and vegetable intakes in cups; minutes of moderate and vigorous physical activity; parenting style (positive or negative); encouraging food socialization practices, and food preparation behaviors by parents.

Assumptions

-The dietary intakes recorded for 24-hour recalls were reported accurately by children and the intakes reflected their usual intakes of foods and beverages.

-The sample of 45 American and 97 Czech children reflected average dietary intakes of children in both countries.

-Food Processor nutrient analysis program computed accurate amounts of nutrients consumed by children in this study.

-Children accurately reported all physical activities in which they were engaged on a previous day. In addition, the amount of time spent in the physical activities was estimated by children accurately.

-True anthropometric data was reported by parents in the Parent Questionnaire.

Limitations of the Study

-The size of the study sample (45 parents and children in the U.S. and 97 parents and children in the Czech Republic) was not a nationally representative sample of parents and children.

-Schools with less than 10% and more than 90% of children receiving free or reduced lunch were excluded before the random selection of schools began in the U.S. Thus, the findings cannot be generalized to children with very low or very high socioeconomic status.

-Children may have not accurately recalled all foods and beverages they consumed during the past 24 hours when completing the multiple-pass 24-hour recalls.

-Children may have under or over-reported the amount and type of physical activities they were engaged in when completing the modified Self-Administered Physical Activity Checklist.

-Because the parental anthropometrics were self-reported, parents may have under-reported or over-reported their height and weight.

-The responses of parents and children may have been based on perceived expectations from the subjects rather than their true dietary intakes, parental behaviors, etc.

Definitions of Terms

At Risk for Overweight: According to the growth charts developed by the Centers for Disease Control and Prevention in 2000, children with BMI-for-age at or above 85th percentile are considered at risk for overweight (Centers for Disease Control and Prevention (CDC), 2002).

Behavioral Capabilities: Behavioral capabilities represent the actual skills and knowledge that a person uses to perform certain tasks. Increased behavioral capabilities have a potential to increase the likelihood of a behavior change by improving the individual's self-confidence, self-efficacy, and positive outcome expectations. Behavioral capabilities are usually developed through skills training, intellectual capacity and learning style (Glanz et al., 1997).

Body Mass Index: Index that accounts for differences in body composition by defining the level of adiposity according to the relationship of weight to height. Measured as weight/height^2 (World Health Organization (WHO), 2000).

Body Mass Index-for-Age: A new definition of overweight and obesity in childhood based on pooled international data for body mass index that is linked to the widely used adult obesity cut off point of 30 kg/m^2 (Cole et al., 2000).

Dietary Reference Intakes: The updated dietary reference values for macronutrients and micronutrients that replaced the series of reports called Recommended Dietary

Allowances (RDA) from 1989. The DRIs consist of four reference values that include Estimated Average Requirements (EAR), Recommended Dietary Allowances (RDA), Adequate Intake (AI), and Tolerable Upper Intake Levels (UL). The DRIs were developed by the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes of the Food and Nutrition Board, Institute of Medicine, the National Academies, and Health Canada. The DRIs represent reference values for nutrient intake by Americans and Canadians (Dietary Recommended Intakes, 2002).

Environment: Environmental factors are defined as any factor influencing a behavior that is external to an individual (Glanz et al., 1997). Two types of environmental factors may have substantial influence on human behavior and behavioral change: social and physical environmental factors.

Expectancies: Expectancies represent the value an individual places on the outcome of a specific behavior (Glanz et al., 1997).

Expectations: An individual's expectations of the results of specific behaviors. Certain expectations develop through previous experiences with similar behaviors, observing others, hearing about a similar situation from others or experiencing physiological or emotional reactions to a behavior (Glanz et al., 1997).

Metabolic Equivalents: One metabolic equivalent is defined as the ratio of the work metabolic rate to the resting metabolic rate. One MET is equal to the amount of oxygen

per kilogram of body weight per minutes that is consumed when sitting quietly, which is equal to 3.5 ml/kg/min or 1 kcal/kg/hour (Ainsworth et al., 2000).

Multiple Pass 24-Hour Recall: A dietary recall that consists of several stages. First, the interviewer asks the respondent to recall all foods and beverages consumed during the previous 24 hours. Then, the interviewer asks the respondents to clarify and specify some of the reported foods or beverages and helps the subjects remember whether they consumed any other foods/drinks as snacks. Lastly, the interviewer asks about cooking methods used for food preparation and helps the subjects recall any condiments or other added ingredients (United States Department of Agriculture (USDA), 1998).

Obesity: In the Czech Republic, children with BMI above 97^{th} percentile are considered obese (Lhotska et al., 1993). In adults, obesity is internationally defined as Body Mass Index of ≥ 30 (kg/m^2) (British Medical Association (BMA), 2005). The CDC currently uses the term "overweight" rather than "obese" for pediatric population in the U.S.

Overweight: According to the growth charts developed by the Centers for Disease Control and Prevention in 2000, children are considered overweight when their BMI-for-age is at or above 95^{th} percentile (CDC, 2002). Czech children are classified as overweight according to the growth charts developed based on the fifth National Anthropological Survey (NAS) in the Czech Republic (Lhotska et al., 1993). Based on these gender- and age-specific growth charts, children at $>90^{th}$ percentile are considered

overweight (Lhotska et al., 1993). Body Mass Index of $\geq$25 kg/m^2 is internationally recognized as the cutoff for overweight in adults (BMA, 2005).

Reciprocal Determinism: A model of reciprocal determinism introduced by Albert Bandura in 1970s'. Reciprocal determinism emphasizes that human behavior is the result of constant, triadic and dynamic interactions between behavior, personal characteristics and the environment (Bandura, 1978). Bandura proposed that many factors determine human behavior and a change in one of the factors often leads to a change in other factors.

Recommended Dietary Allowances: The levels of intakes of essential nutrients that, on the basis of scientific knowledge, are judged by the Food and Nutrition Board to be adequate to meet the known nutrient needs of practically all healthy people (Recommended Dietary Allowances (RDA), 1989).

Reinforcement: According to SCT, a behavior change can be facilitated through receiving a direct reward for their behavior, observing other peoples' behaviors and through seeing them receive incentives for their actions. Three types of reinforcement have been identified in literature: direct reinforcement, vicarious reinforcement, and self-reinforcement (Glanz et al., 1997). Reinforcements can be either external or internal, depending on the source of reinforcement (Lepper & Green, 1978).

Self-efficacy: Self-efficacy refers to the personal judgment of an individual that she or he can achieve something and believes in his or her skills and abilities to adopt a particular behavior (Bandura, 1986). Self-efficacy represents a person's confidence in performing a specific behavior (Glanz et al., 1997).

Social Cognitive Theory: Social Cognitive Theory (SCT) seeks to explain the mechanisms of human behavior and describe the processes that can be used to achieve successful behavioral changes within individuals (Bandura, 1978). This complex theoretical framework originated from Social Learning Theory (SLT), which was developed by Miller and Dollard in the early 1940's (Miller & Dollard, 1941).

Abbreviations

BMI	Body Mass Index
BMI-for-Age	Body Mass Index for Age
CDC	Centers for Disease Control and Prevention
CVD	Cardiovascular disease
DRI	Dietary Reference Intakes
MET	Metabolic Equivalent
NCHS	National Center for Health Statistics
PQ	Parent Questionnaire
RDA	Recommended Dietary Allowances
SAPAC	Self-Administered Physical Activity Checklist

SCT	Social Cognitive Theory
WHO	World Health Organization

CHAPTER II

REVIEW OF LITERATURE

Health and Nutritional Status of Children in the U.S.

The number of overweight and obese individuals has increased significantly during the last several decades in the United States (Kucmarski et al., 1994; Webber et al., 1995; Gidding et al., 1995; Ogden et al., 2002). The current obesity rates have reached the stage of a national epidemic that is having a tremendous negative impact on public health and on the economy in the U.S. (Flegal et al., 1998; Rippe, 1998). The prevalence of adult obesity has increased by as much as 40% in the last several decades (Kuczmarski et al., 1994). Recent estimates indicate that more than 60% of adults are overweight, with 30% of American adults being obese (Centers for Disease Control and Prevention (CDC), 2006).

Childhood and adolescent obesity has also increased dramatically in recent years (Freedman et al., 1997; Gidding et al., 1995; Ogden et al., 2002). A decade ago, 11% of American children were overweight and one in every four children was at risk of becoming overweight (Kucmarski et al., 1994; Webber et al., 1995; Guo et al., 1994). A recent study by Ogden et al. (2002) found that up to 22% of American youth are currently overweight. In addition, this study found that one in every 3 children was either

overweight or at risk for becoming overweight. A study of children in Bogalusa, Louisiana found that Body Mass Index (BMI) of 10 year old children increased from 17.2 to 19.6 and the percent of overweight children increased from 13% to 39% during the two study periods (1973-1982 and 1983-1994) (Webber et al., 1995; Freedman et al., 1987; Freedman et al., 1997; Gidding et al., 1995). According to Flegal et al. (1998), this trend is occurring in both genders, all age, racial/ethnic, and socioeconomic groups. For instance, approximately 38-40 percent of Native American youth aged 5 to 18 were found to be overweight in several studies (Zephier et al., 1999; Rinderknecht & Smith, 2002).

This trend is particularly disturbing since previous studies have demonstrated that the majority of overweight children remain overweight or obese as adults (Webber et al., 1995; Guo, et al. 1994; Whitaker et al., 1997). According to Serdula et al. (1993) and Freedman et al. (1987), many children with increased adiposity remain overweight for up to 20 years of their adult life. Similarly, Guo et al. (1994) found that obesity at age 35 is predicted by childhood BMI. Annual anthropometric data from a sample of 555 white males and females aged 1 to 18 and 30 to 39 of diverse socioeconomic background was collected. A logistic regression analysis was used to predict overweight at age 35 based on childhood BMI percentiles. The odds ratios of becoming obese at age 35 were significantly higher for overweight adolescents.

The increase in obesity in the U.S. represents a serious national concern for several reasons. First, obesity significantly increases the risks of several chronic diseases such as cardiovascular disease, type 2 diabetes, hypertension, dyslipidemia and other conditions (USDHHS, 1998; NIH, 1985). Moreover, obesity developed early in life has been shown to put individuals at greater risk for the development of coronary heart

disease, hypertension and type 2 diabetes in adult life (Johnston, 1985; Aristimuno et al., 1984; Abraham et al., 1971). Obesity also plays a significant role in recent increases in the prevalence of diabetes among both American adults and children and excess weight may be responsible for the onset of this condition early in life (Fagot-Campagna et al., 2000; WHO, 2000; Harris et al, 1998). Second, obesity represents a burden on national health care and the economy due to the high cost of treatment of chronic diseases. According to the 1998 report of the National Institutes of Health (1998), the expenses associated with obesity and related conditions reached $99 billion every year. Because adopting healthy eating behaviors can help decrease both personal as well as national expenditures for health care, there is an urgent need for effective prevention programs and interventions that would help reduce and prevent obesity.

The issues surrounding obesity are very complex and involve a wide range of factors that may be influencing children's body weight and adiposity. Previous studies identified several possible causes of the current obesity epidemic among children and adolescents. The possible causes of obesity include excessive intakes of energy and fat, increased fast food consumption and portion sizes, decreased fruit and vegetable intakes, lack of physical activity and greater television watching (Neumark-Sztainer et al., 2003a; Gray & Smith, 2003). The dietary and physical activity behaviors that have been associated with obesity among children are discussed in the following sections.

Energy and Fat Intakes of American Children

While the prevalence of overweight children has been increasing in recent years, both positive and negative trends have been identified in the diet composition among youth (Nicklas et al., 2001a; Munoz et al., 1997). Numerous research studies indicated that the macronutrient composition and food intakes of American children have changed in the last 30 years. Nicklas et al. (2001a; 1993), and Morton and Guthrie (1999) showed that carbohydrate and protein intakes increased and the intake of total fat significantly decreased from 38% to 33% between 1973 and 1994. The study also indicated that the consumption of energy from polyunsaturated fats increased while the percentage of energy derived from saturated and monounsaturated fatty acids declined over the last several decades (Nicklas et al., 2001a). While this study determined important trends in children's macronutrient consumption, the results may be misleading because the decrease in fat intake as a proportion of total energy may be reflecting an increase in total energy consumption among children within the last three decades.

Nutrition experts agree that obesity results from an imbalance between energy intake and energy expenditure that is influenced by a variety of dietary, behavioral, genetic and environmental factors (DeLany, 1998; DRI, 2002). In terms of dietary influence on energy imbalance, research shows that total energy intake, preference for high-fat foods and percentage of energy derived from fat are all associated with children's body weight (Troiano et al., 2000; Robertson et al., 1999). Children who consume high-fat diets tend to exceed their energy requirements on a daily basis (Kendall et al, 1991; Stubbs et al., 1995). In Europe, diets that are high in saturated fat and

energy-dense foods, along with physical inactivity are considered to be the major cause of obesity epidemic (WHO, 2001b). Based on the scientific evidence, the American Dietetic Association suggests that dietary fat intake exceeding 35% of total energy may lead to an increased risk for obesity among 4 to 18 year old children (American Dietetic Association, 2004). Unfortunately, Nicklas et al. (2001a) indicated that American children have increased their consumption of fat from poultry, cheese and snacks in the last three decades. The 1973-1994 Bogalusa Heart Study found that almost 75% of children exceeded fat intake recommendations (Nicklas et al., 2001b). The results of these studies indicate that the obesity epidemic among American children may be associated with a recent increase in the consumption of high-fat foods.

Given the increase in dietary fat intake of children, it is not surprising that their energy intake has significantly increased as well in the last 25 years (Nielsen et al., 2002; Wright et al., 2003). Several research studies suggested that the availability of fast foods and other energy- dense foods, and increased portion sizes, contribute to children consuming more energy than in the past (Robertson et al., 1999; Troiano et al., 2000). For instance, a large national study by Paeratakul et al. (2003) examined dietary intakes of American children and adults in association with fast food consumption. The results indicated that 42% of the surveyed children consumed fast food and their energy and fat intakes were significantly higher compared to children who did not report fast food consumption ($p<0.001$).

In addition to excess energy and fat, the dietary intakes of many children do not meet the recommendations for a healthy diet defined by the Food Guide Pyramid that was developed by the United States Department of Agriculture (USDA) (Munoz et al., 1997).

A study of 1,797 second and fifth graders by Wolfe and Campbell (1993) found that 20% of the children did not consume fruit on the day of the data collection and nearly half of the children did not have any vegetables during the day. Moreover, children's dietary intakes are high in fat and low in several important nutrients such as calcium and iron (Lin et al., 1999).

Fast Foods, Soft Drink Consumption, and Portion Size

Fast food establishments have become an essential part of American culture in the last several decades (French et al., 2000; National Restaurant Association, 2002; Clauson, 1999; Lin et al., 1999). Most American children, especially older ones, eat 25% of their meals away from home, with half of their meals consumed in fast food restaurants (Lin et al., 1998). The proportion of energy coming from meals outside of home increased from 18% to 34% (energy coming from fast food restaurants alone increased from 3% to 12%) between 1977/78 and 1994/96 (Lin et al., 1998; Nicklas et al., 2001a). Unfortunately, changes in lifestyle, including frequent eating away from home, may contribute to current obesity rates and poor diets in American children (Popkin et al., 2001; Nicklas et al., 2001a).

Frequent fast food consumption has been strongly associated with an increased risk not only for obesity but also for other conditions, such as cardiovascular disease and osteoporosis (Abraham et al., 1971; Hoffmans et al., 1989). Several studies showed that individuals consuming fast foods often have diets that are high in energy and fat but low in several important nutrients (Bowman et al., 2004; Clemens et al., 1999; McCrory et al.,

1999; Coll et al., 1979). Fast food consumption has been associated with increased consumption of soft drinks, fried potatoes, and decreased intake of fruits, vegetables, and milk in children (French et al., 2000; French et al., 2001; Paeratakul et al., 2003). In addition, Paeratakul et al. (2003) and Bowman et al. (2004) found that most of the individuals consuming fast food had increased intakes of energy, fat, saturated fat, added sugars, and sodium. Their intake of fiber, milk, fruit and non-starchy vegetables were lower compared to children who did not consume fast food. One of the most alarming trends in dietary intakes among children and adolescents is the significant increase in soft drink consumption over the past several decades (Harnack et al., 1999; Troiano et al., 2000**,** Wysnack, 2000; Morton & Guthrie, 1999). A study by French et al. (2003) suggested that the amount of energy from soft drinks doubled between 1977/78 and 1994/98 among children aged 6 to 17. The average consumption of soft drinks per day increased from 5 to 12 fluid ounces. Cullen et al. (2002b) examined soft drink consumption in a sample of Euro-, African- and Mexican Americans 4 to 6th graders. The results showed that 51% of the total beverages children consumed consisted of sweetened beverages, with Mexican Americans having the highest rates of soft drink consumption. The consumption of soft drinks increased with age and lower parental education. Several studies have associated soft drink consumption with higher energy intakes which is likely to result in an increased risk for obesity and other chronic diseases (Ludwig et al., 2001; Troiano et al., 2000**,** Wysnack, 2000; Borrud et al., 1997; Harnack et al., 1999; Troiano et al., 2000; Bandini et al., 1999).

Higher soft drink consumption among children is associated with several changes that have occurred on familial, social and economic levels (Lin et al., 1999; Pendergrast,

2000; French et al., 2001). First, many families eat away from home more frequently and dine more often in fast food restaurants than in the past. As a result, children have greater access to sweetened beverages. Second, children and adolescents have become the primary targets of soft drink advertisement and marketing, which stimulates their interest and desire to consume these products. Third, the availability of soft drinks at schools has increased significantly, thus allowing children to consume soft drinks on daily basis. According to the National School Health Policies and Programs Study, vending machines, often containing soft drinks, were found in 50% of the elementary schools, 75% of the middle schools, and 96% of the high schools surveyed in the study (Wechsler et al., 2001). Along with high energy and sugar content, soft drinks tend to replace more nutritionally sound beverages such as milk and 100% fruit juices in children's diets (Larsen, 2001).

Along with the increased consumption of soft drinks and fast foods, there has been an increase in the portion size of foods commonly consumed by children and adolescents (Nicklas et al., 2001a). The average size of a hamburger in a fast-food restaurant increased from one to six ounces of meat between 1957 and 1997. Similarly, the average size of soft drinks increased from 8 to 32-64 fluid ounces. In addition, a regular sized muffin weighted 1.5 oz in 1957 compared to 5-8 oz in 1997. Several research studies have indicated that individuals tend to consume more food when they are served larger amounts of food (Edelman et al. 1986; Rolls et al. 2000; Hill & Peters, 1998). Thus, larger portion sizes may be contributing to obesity among American children.

Fruit and Vegetable Intakes

Studies have shown that an adequate consumption of fruits and vegetables may decrease the risk of several chronic diseases, including obesity, cardiovascular disease and diabetes (Dennison et al, 1998). Regular intake of fruits and vegetables may significantly increase children's satiation and reduce their energy intake which in a long run may directly affect their body weight (Rolls et al., 2004; Rolls, 1995). Current research suggests that successful treatment of obesity is very difficult to realize due to a variety of personal, behavioral, and environmental factors that influence individuals' dietary intake (British Medical Association (BMA), 2005). Therefore, recent intervention studies focused on increasing fruit and vegetable intake and exercise rather than on limiting the consumption of particular foods among children (Jamner et al., 2004; Gortmaker et al., 1999; Fischer & Birch, 1999b). Both high consumption of fruits and vegetables and regular physical activity can serve as preventative measures against obesity development at early age (Epstein et al., 2001).

Because fruits and vegetables are high in nutrients and contain relatively few calories, children consuming fruits and vegetables on a regular basis tend to consume less energy compared to their peers. Over time, small decreases in energy intake may translate into weight maintenance or weight loss as children continue to grow and develop (Epstein et al., 2001). A randomized study with obese parents and their non-obese children showed that an emphasis on fruit and vegetable consumption yields better results in terms of dietary quality and body weight than a dietary restriction of fat and sugar (Epstein et al., 2001). Children and parents who were enrolled in the "Increase

fruit and vegetable" intervention group reported not only a higher fruit and vegetable consumption, but also a decrease in fat and sugar intake at the end of a 1-year study (Epstein et al., 2001). In addition, parents in the "Increased fruit and vegetable" group were able to decrease their body weight to a greater degree compared to the other group throughout the intervention (Epstein et al., 2001).

Despite the known benefits of fruits and vegetables in relation to the prevention of obesity and other chronic diseases, American children do not meet the current dietary recommendation of consuming at least five servings of fruits and vegetables a day (Dennison et al., 1998). Based on the results from the Continuing Survey of Food Intakes by Individuals (CSFII) from 1994-1996, only 45% and 35% of school-aged children met the minimum recommendation for vegetable and fruit consumption (Dennison et al., 1998). The increased consumption of fast foods and soft drinks has been associated with low intakes of fruits and vegetables among American children (Harnack et al., 1999; Cullen et al., 2002b). In a study by Harnack et al. (1999), children with the highest soft drink consumption in the study sample were less likely to drink 4 ounces of fruit juice per day. The low fruit and vegetable consumption was also reflected in their low intakes of vitamin C and vitamin A. Cullen at el. (2002b) examined the impact of sweetened beverages, including soft drinks and fruit flavored drinks, on children's intakes of fruit and vegetables in 504 fourth, fifth and sixth graders. The study found that children who consumed large amounts of sweetened drinks were less likely to consume fruits and more likely to consume high fat vegetables. The findings of the study suggested that the overall dietary quality was lower among children with a high consumption of sweetened beverages compared to children who consumed less sweetened beverages.

Physical Activity

Despite public awareness of the importance of exercise in obesity and other diseases prevention, physical activity has dramatically decreased among American children and adolescents over the last several decades (U.S. Department of Health and Human Services, 1996). It is estimated that 14% of American children aged 12 to 21 are not physically active at all and less than 50% engage in regular vigorous exercise (CDC, 2004). The situation has worsened in part because many schools no longer require children to participate in physical education classes. According to the U.S. Department of Health and Human Services (1996), the physical education class enrollment among girls decreased from 41% in 1991 to 25% in 1995. Myers et al. (1996) found that the level of physical activity among 9 to 15 year old children decreased with age, while sedentary behaviors increased with age. In a study by Gray and Smith (2003), 59% of Native American children aged 5 to 18 were found to be sedentary, with 13 to 18 year olds spending as much as 4 hours a day watching TV. Other research studies showed that children spent an average of 3-4 hours a day watching TV and another 3 hours a day using a computer or playing video games (Nestle & Jacobson, 2000; Annenberg Public Policy, 1997). In addition, Robinson (1999) found that TV watching was significantly correlated with decreased energy expenditure and increased appetite. Previous studies have linked TV watching to an increased risk of obesity among children and adolescents (Dietz & Gortmaker, 1985; Eisenmann et al., 2002). In terms of gender and racial differences, black children and girls engaged significantly less often in physical activity compared to white children and males (Andersen et al., 1998).

In an attempt to decrease obesity rates among children and adults, Healthy People 2010 put a strong emphasis on increasing physical activity (USDA, 2000). It is well established that regular exercise can significantly decrease the risk of chronic diseases and improve the overall health and well-being of individuals (Corbin & Pangrazi, 1993; Myers et al., 1996). Furthermore, the risk of developing obesity may be significantly lowered by relatively low levels of physical activity while a sedentary lifestyle is likely to increase the risk of becoming obese (Corbin & Pangrazi, 1993, Salmon et al. 2000; Robinson, 1999).

Because of the importance of exercise in obesity reduction and prevention, numerous interventions have been implemented in order to increase physical activity among children in the last two decades. Most of the interventions were school-based and their primary goals included increasing physical activity and improving dietary intakes among children (Gortmaker et al., 1999; Jamner et al., 2004; Neumark-Sztainer et al., 2003b; Pangrazi et al., 2003). While the majority of the interventions were successful in increasing children's awareness and knowledge of the benefits related to regular exercise, many interventions failed to increase children's actual physical activity outside of school. Few interventions resulted in lower body mass indices among children (Caballero et al., 2003; McMurray et al., 2002; Jamner et al., 2004; Neumark-Sztainer et al., 2003b). For instance, a two-year long multidisciplinary intervention called "Eat Well and Keep Moving" was successful in terms of increasing fruit and vegetable intakes among fourth, fifth and sixth graders, but it was ineffective in changing children's behaviors regarding their regular physical activity (Gortmaker et al., 1999). The Food for Fun (FOR) program, a 9-month long program, was also designed to increase physical activity and

improve healthy eating among adolescents. Similarly to the "Eat Well and Keep Moving" program, the FOR intervention was effective in increasing adolescents nutrition knowledge and improving dietary behaviors, but it failed to achieve similar results in terms of physical activity (Agron et al., 2002). A variety of variables may have contributed to the lack of positive impact of similar interventions on children's physical activity, including the relatively short duration of the interventions, a limited availability of physical education curriculum in the participating public schools, or a lack of parental support within a family environment (Caballero et al., 2003; Gortmaker et al., 1999; Hopper et al., 1996).

Body Image Perceptions Among Children

Positive body image and satisfaction with one's own body size should be expected in healthy children and adolescents. However, a strong emphasis on thinness as the standard of beauty has become a dominant norm in American and other Western cultures (Tiggeman, 1992; Cohn & Adler, 1992; Garner & Wooley, 1991). Previous studies have demonstrated a high prevalence of dissatisfaction with body size and dietary restraint among children and adolescents in both the U.S. and some European countries (Tiggeman & Wilson-Barret, 1998; Braet & Wydhooge, 2000; Hill et al., 1994; Wood et al., 1996; Thomas et al., 2000; Shapiro et al., 1997). For instance, in a study of 745 Belgian 9 to 11 year old children, 6.5% reported that they often restricted their dietary intake (Braet & Wydhooge, 2000).

This cultural norm for thinness has been imposed especially on females (Thompson & Smolak, 2001; Boschi et al., 2003; Contento et al., 2003). The results of several studies indicated that 40-70% of girls and women experience a body image disturbance and would like to lose weight (Rodin et al., 1985; CDC, 1991; Brumberg, 1988). Even though negative body image perceptions are more prevalent among girls, boys are also often dissatisfied with their bodies. Their dissatisfaction varies from wanting to lose weight to gain weight and muscle (Davison et al., 2000; Thelen & Cormier, 1995; Shur et al., 2000).

Given the societal pressure to be thin and the high rates of body image dissatisfaction among children, it is apparent that frequent dieting and constant concern about weight have become a part of life (Hill et al., 1994). In this environment, children and adolescents may develop distorted body image perceptions and unhealthy eating behaviors. Moreover, body image disturbances (BID) and dissatisfaction with body weight are likely to continue into adulthood and may have serious consequences on mental and physical health of children. Unhealthy eating behaviors, low self-esteem, depression, and development of eating disorders are common consequences of distorted body image and dissatisfaction with body weight (Stice et al., 2000; Kelly et al., 1999; American Psychiatric Association, 1994; Coughlin et al., 2003; Patton et al., 1990). According to Hill et al. (1994), overweight children are more likely to engage in dietary restraint compared to healthy-weight children. Unfortunately, such dietary restraints often contribute to obesity problems due to frequent weight loss and gain and a decrease in metabolic rate (Garner & Wooley, 1991).

Parental and Media Influences on Body Image. Body image perceptions are often influenced by a variety of social and environmental factors, including parents and media. Parents seem to have a tremendous impact on their children's body image perceptions and satisfaction with body weight (Thompson & Smolak, 2001; Cuadrado et al., 2000; Gralen et al., 1990; Austin, 2000). In a study involving 8 to 13 year old children, 70% of children reported that they learned about dieting from their parents (Shur et al., 2000). Several studies suggested that children's perceptions of ideal body weight and desire to lose weight are strongly influenced by their parents' behaviors and direct comments regarding their own or their children's weight, especially in pre-adolescent and adolescent years (Smolak et al., 1999; Klesges et al., 1986; Contento et al., 2003). Striegel-Moore and Kearney-Cooke (1994) showed that females and older children are more susceptible to being negatively influenced by their parents in terms of their body image and body size acceptance. For example, 6 to 11 year old children were evaluated in a negative way by their parents more frequently than 2 to 5 year old children. In addition, research indicates that mothers have especially strong influence on children's thoughts and feelings regarding their own body weight and size (Thelen & Cormier, 1995; Thompson & Smolak, 2001). According to several studies on middle class white women, preschool children's perceptions of their body weight were significantly influenced by their mothers' diet restrictions and other food-related behaviors (Fisher & Birch, 1999a,b; Birch & Fisher, 2000; Birch & Fisher, 1998; Tiggeman & Lowes, 2002).

Media also plays a significant role in influencing children's body image. Media's role on the development of children's body image and dietary restraints was reflected in a study by Tiggeman and Wilson-Barret (1998), where most 7 to 12 year old girls

expressed dissatisfaction with their weight and desired to have smaller bodies. Interestingly, girls' responses indicated that ideal body size was not based on the level of attractiveness for boys but on the standards established in the society through media.

Cultural Influences on Body Image. In addition to parental and media influences, body image perceptions of children are often influenced by cultural factors. Thus, the standard of beauty and body weight satisfaction varies throughout the world (Crandall & Martinez, 1996; Ritenbaugh, 1982; Contento et al., 2003; Snooks & Hall, 2002). While the emphasis on thinness predominates in many Western cultures, differences in ideal body image perceptions exist between various racial and ethnic groups. For instance, a cross-sectional study of Latino mothers and their young children (5 to 7 years old) indicated that most of the Latino women did not perceive their overweight children as plump or unhealthy (Contento et al., 2003). Moreover, some of the mothers classified their children, regardless gender, as too thin even though they were between the 50-75th percentile for BMI-for-age (Contento et al., 2003). Research by Baughum et al. (2000) demonstrated that while most mothers assessed their own body size accurately, 80% of them did not accurately evaluate their preschool-aged children as overweight.

Several studies have also shown that the ideal body size among African American women is significantly larger than among white women, and that African American females have more positive acceptance of their bodies (Powel & Kahn, 1995; Thompson et al., 1997; Rucker & Cash, 1992). Thompson et al. (1997) found that the percentage of 8 to 12 year old girls wanting to lose weight was significantly smaller among African Americans than white children. There was no difference in the percentage of boys

desiring a different body size between the two racial groups. These results further demonstrate that African American females prefer a heavier body type and have higher social acceptance of adiposity.

While there are differences in body image perceptions and standards of beauty between some racial groups within the U.S., no previous studies have compared the cultural standards of body weight, children's perceptions of their own and ideal body weight and parental perceptions of their child's weight between U.S. and another country. Because children in other countries are influenced by different social and cultural factors within the society, they may be subjected to a different standard of beauty and may have healthier body image perceptions compared to children in the U.S. and other Western countries.

Child Obesity Around the World

The rates of obesity among children have increased not only in the U.S., but also in many other countries around the world. Furthermore, the obesity epidemic has reached not only industrialized countries but also developing nations (Martorell et al., 2000). Many health professionals are concerned that the obesity rates among European children will reach epidemic proportions in the near future. A trend toward increased obesity rates has already been confirmed among school-aged children in several European countries (Savva et al., 2002; Rolland-Cachera et al., 2002; Zimmermann et al., 2000). In a study by Bundred et al. (2001), the prevalence of overweight and obese British children rose from 14.7% and 5.4% to 23.6% and 9.2% between 1989 and 1998.

Similarly, the percentage of overweight German girls increased from 11.7% to 20.7% between 1975 and 1995 (Kromeyer-Hauschild et al., 1999). However, French children continue to have significantly lower BMIs compared to American children, although the obesity rates for adults in France are comparable to other Western European countries (Rolland-Cachera et al., 2002).

While the rates of child obesity continue to increase in the U.S. and Western Europe, Silventoinen et al. (2004) found that BMIs of children in some Central and Eastern European countries are gradually decreasing. A similar trend was observed in the U.S., Israel, and several European countries in a study by Lissau et al. (2004) that was conducted in 1997. The study indicated that the prevalence of overweight children aged 13 and 15 was significantly higher in the U.S. compared to 14 other developed countries. In addition to the U.S., the findings also identified Greece and Israel as countries with significantly higher prevalence of child obesity compared to the rest of the study sample. Ireland, Finland and Greece had the highest prevalence of overweight 13-year old children in the study. On the other hand, the findings indicated that children from Lithuania and Czech Republic had the lowest prevalence of BMI above 85th percentile in the study sample. The health status, dietary intakes and other factors influencing children's body weight in the Czech Republic are described in the following section.

Nutrition and Health History of the Czech Republic

The Czech Republic, formerly part of Czechoslovakia, is a small country in Central Europe that was under a communist rule from 1948 to 1989. Prior to the Velvet

Revolution in 1989, the Czech population suffered from high rates of cardiovascular disease, cancer, and obesity in adults (Ginter, 1997). By the 1980's 40% of Czech middle-aged adults were obese (Andel, 1997). During the 1970's and 1980's, Czechoslovakia had some of the highest rates of cardiovascular mortality and morbidity among European countries (Ginter, 1997; Bobak et al., 1997). The prevalence of diabetes almost doubled between 1970 and 1989 (Andel, 1997). In fact, the general health status of Czech citizens was among the worst in Europe.

The poor health and nutritional status of Czech adults and children was largely caused by the political, social and economic situation in the former Czechoslovakia. Several factors contributed to the high rates of chronic diseases and obesity among Czech individuals. First, there was a lack of healthy food choices due to a diminished import from Western countries, with the exception of locally grown, seasonal fruits and vegetables. Second, in order to boost the sales of meat and dairy products, the communist government promoted the consumption of high fat meats and full-fat dairy products by keeping the prices artificially low. Third, there was almost a complete lack of disease prevention programs within the Czechoslovakian health care system. In addition, the awareness of health and nutrition issues among the general public and access to information for individuals was minimal under the totalitarian regime (Ginter, 1997).

After the fall of the communist regime, many political, social and economic changes occurred in the Czech Republic that significantly improved the health and nutritional status of the entire Czech population (Parizkova, 2000). The variety and selection of food products increased tremendously when the free market system replaced

the centrally planned economy that had existed in the Czechoslovakia for 40 years. Czech consumers were finally given the opportunity to make healthier food choices and select from a variety of fruits, vegetables and other nutrient-dense products. Furthermore, health-related efforts shifted to preventing chronic diseases and the quality of health care services improved since the fall of communism in 1989 (Andel, 1997). These changes had a tremendous impact on the health and nutrition of Czech individuals. For instance, there was a 20% reduction in morbidity and mortality rates from acute coronary heart disease in middle-aged adults and a 15% decrease in hypercholesterolemia in middle-aged men between 1990 and 1997 (Andel, 1997). In addition, life expectancy increased from 68 to 69 years within the same period (Andel, 1997).

The influx of Western culture also brought some negative nutritional trends that are quickly being adopted, particularly by the younger generations, and these trends may reverse some of the positive changes that occurred after the fall of communism. An example of such negative trends is an increase in fast food consumption (soft drinks, pizza, hamburgers, French fries etc.), and eating away from home more frequently. In addition, Western convenience has been infused through quick and easy microwaveable meals and frozen dinners (Humenikova, 2003).

Czech Traditional Diet and Western Dietary Trends

The Czech traditional diet is very similar to that of other Eastern and Central European countries (WHO, 2001a). The diet is characterized by large amounts of meat and saturated fats, and by lower amounts of fruits and vegetables (Filiberti et al., 1995).

Common staples in the Czech diet include pork, beef, wheat, and potatoes. Potatoes are the most widely consumed vegetable in the Czech region and have been a part of Czech diet for centuries (Benesova & Havelkova, 1999). Along with traditional dumplings, the Czech diet also includes a wide variety of meats and dairy products. Fatty meat products such as sausages and salamis remain relatively popular among Czech people, and overall meat consumption in the Czech Republic is higher than in many countries (Ginter, 1997). Due to the popularity of cream-based sauces, butter and cream are used in typical Czech cuisine. In a comparative study of food consumption in 12 countries, Ginter (1997) found that Czechoslovakia ranked second highest in butter consumption.

After the 1989 Revolution, the food patterns of the Czech population, including children, significantly improved (Andel, 1997). For example, the consumption of beef decreased 34% between 1990 and 1997. Butter consumption decreased by half during the same period, although intake remains high. While the consumption of fruits and vegetables was significantly lower in Czechoslovakia during communism compared to many other countries, including West Germany and the U.S., their popularity has been increasing because of the increased availability of fruits and vegetables in recent years (Ginter, 1997). However, most Czech children probably do not consume the recommended amount of fruits and vegetables and it is reflected in their low intakes of vitamin A and vitamin C (Parizkova, 2000). Aside from personal preferences and parental influences, it is possible that the deregulation of market prices of fruits and vegetables and other products after the fall of communism may be responsible for lower intakes of fruits and vegetables in the Czech Republic (Andel, 1997; WHO, 2001a).

Despite an unhealthy traditional diet and the recent influx of negative Western dietary and lifestyle trends into the country, Czech children were found to have lower BMIs than children in the U.S. and several other European countries (Lissau et al., 2004). Thus, a variety of social and environmental factors may be responsible for Czech children consuming healthier dietary behaviors and being more physically active which in turn leads to lower obesity rates in the Czech Republic.

Socio-Economic and Cultural Aspects of Obesity

In the last three decades, the obesity epidemic has reached many countries at all stages of economic development around the world (Skelton, 2004). The highest prevalence of obesity has been noted in industrialized countries such as the U.S. and Great Britain (Skelton, 2004). However, adult and child obesity has also become a public health issue in many countries that are undergoing massive economic transitions, including post-communist countries and developing nations (WHO, 2003). While the factors associated with obesity differ between developed and developing nations, the social, economic, and cultural aspects of childhood obesity appear relatively similar in the U.S. and post-communist countries, such as the Czech Republic.

Socio-Economic Aspects of Obesity

In Western countries, the risk of obesity has been negatively associated with socioeconomic status and educational level (Parsons et al., 1999). Lack of access to

nutrient-dense foods, money to purchase healthy products and opportunities to be physical active have been identified as contributing factors to the high prevalence of obesity among individuals from low-income families (BMA, 2005). Similar obstacles to a healthy diet have been identified in a variety of populations within the U.S. and other Western countries (Agras et al., 2004). In a cross-sectional study of 4,511 school-aged Portugese children and their parents, higher parental education was found to be a protective factor in terms of children's risk for overweight and obesity (Padez et al., 2005). Because parental education is directly associated with parental socioeconomic status, the findings confirmed the results of previous studies that found low socioeconomic status to be directly related to higher prevalence of obesity among children (Gnavi et al., 2000).

Low socio-economic status and parental education also appear to be related to obesity in post-communist countries (Kovarova et al., 2002; Vignerova & Blaha, 1996). In the Czech Republic, the prevalence of obesity was found to be 9.6% in children whose mothers had elementary education; in contrast, only 3.7% of children whose mothers had university education were obese (Kovarova et al., 2002). These findings were confirmed in a recent study by Vignerova et al. (2004). The study indicated that a higher educational level of parents was associated with lower parental BMI as well as lower obesity rates among children. In fact, the prevalence of obese children was almost twice as high in families where both parents had elementary education compared to families where both parents had university education (7% vs. 3.3%) (Vignerova et al., 2004).

Cultural Aspects of Obesity

Despite the alarming rates of child and adult obesity, a strong emphasis on thinness as the standard of beauty has become a dominant social norm in the U.S. and other developed countries (Tiggeman, 1992; Cohn & Adler, 1992). Even though negative body image perceptions are more prevalent among girls, boys from Western countries are also often dissatisfied with their bodies (Davidson et al., 2000; Thelen & Cormier, 1995; Schur et al., 2000). Because of the social norm of thinness in Western countries, overweight individuals, including children, are often stigmatized within the society which impacts their psychological health and dietary behaviors (Hill et al., 1994).

Because standards of beauty and acceptance of adiposity are influenced by social, cultural and economical factors, the symbolic meaning of children's weight varies among diverse cultures (Crandall & Martinez, 1996; Contento et al., 2003; Snooks & Hall, 2002). The emphasis on thinness predominates in many Western cultures, but differences in ideal body size preference exist between various racial, ethnic and cultural groups. For example, many societies around the world value plumpness over thinness, and fatness is viewed as a sign of beauty, status and prosperity (Mokhtar, 2001; Prentice & Webb, 2006; Brown & Konner, 1987). Because many cultures have standards of beauty based on higher adiposity and plumpness, a positive value is placed on being heavy (Prentice & Webb, 2006). Children who are plump and have higher body fat are considered to be healthier than thin children. In the U.S., Latino mothers have been shown to prefer their children to be plump rather than thin (Contento et al., 2003). Studies have also shown that the ideal body size for African American women is significantly larger compared to

Caucasian women (Powel & Kahn, 1995; Thompson et al., 1997). This trend is apparent in the finding that African American females, regardless their weight status, have greater acceptance of their body size and prefer a larger body size than Caucasian and Hispanic adolescents (Perry et al., 2004; Rucker & Cash, 1992). These results suggest that some racial and cultural groups prefer a heavier body size and have a higher social acceptance of adiposity compared to other groups.

In many Eastern European countries, children and adolescents are in a unique situation in terms of cultural standards of beauty and acceptance of a certain body size. Because of the economic, political and social transformations in the former Soviet Union block, youth are increasingly exposed to the Western dietary and lifestyle trends as well as Western standards of beauty (Humenikova, 2003; Keski-Rahkonen, 2005). Nasser et al. (2001) suggested that the prevalence of eating disorders may be very high in the countries that are undergoing dynamic cultural and political changes. For example, girls from the former Soviet Union seem to develop an unhealthy body image more frequently compared to girls from other Western countries (Sarlio-Lahteenkorva et al., 2003). When a sample of Czech girls and their mothers was compared to German girls and their mothers, the findings indicated that the ideal BMI of Czech women was lower compared to German women (Pecova & von Wietersheim, 2005). A study by Krch (1995) found that 12% of Czech female subjects were regularly fasting and 4% of women used laxatives to achieve an ideal body weight. The results of the study suggested that women from the former communist countries are increasingly adopting Western standards of beauty and this trend is reflected in the increased use of unhealthy weight reduction techniques (Krch, 1995).

Definition of Child Obesity and Growth Charts

Monitoring growth and development is the best known approach for evaluating children's nutritional status and overall well-being, including the risk for overweight and obesity (Kuczmarski et al., 2000). Until recent years, weight-for-height indices have been the most commonly used indices for evaluating children at risk for overweight and obesity (Flynn et al., 2006). Growth charts developed by the National Center for Health Statistics (NCHS) in 1977 have been used extensively for both clinical and epidemiological assessment of American children for the past thirty years (Kuczmarski et al., 2000). The 1977 NCHS growth charts were, for all ages except for infants, developed based on three national health examination surveys and were adapted by the World Health Organization for its use in 1978 (Kuczmarski et al., 2000; WHO, 1978). The CDC revised the original 1977 growth charts so normal distribution would allow for calculating z-scores that would reflect the standard deviation below and above the median (Dibley et al., 1987). Currently, the WHO continues to use the NCHS growth charts, including weight-for-height indices, to monitor and evaluate growth, development and nutritional status of pediatric populations around the world (Kuczmarski et al., 2000).

Because of the need to incorporate new nationally representative data into the original 1977 NCHS growth charts, the CDC initiated revision of the growth charts that resulted in a release of updated and statistically advanced growth charts in 2000 (Kuzcmarski et al., 2000). Data from the second and third National Health and Examination Survey (NHANES II and III) were used to revise the 2000 CDC growth charts and significant changes were made to the original growth charts. The 1977 NCHS

weight-for-stature indices were replaced with gender-specific BMI-for-age growth charts for children aged 2 to 20 (Kuczmarski et al., 2000). The updated growth charts also allow for identifying children who are at risk for overweight ($\geq 85^{th}$ percentile) and obese ($\geq 95^{th}$ percentile). Because of the increased prevalence of obesity among American children, data from the NHANES III for children 6 years and older were not considered during the revision of the 1977 NCHS growth charts to prevent misclassifying overweight children as at normal weight (Kuczmarski et al., 2000).

Body mass index (BMI) represents an internationally recognized standard for defining overweight and obesity in adults (Haslam & James, 2005; WHO, 1995; BMA, 2005). BMI has been used for identifying adults with excess adiposity by clinicians and researchers around the world for the past several decades. Overweight in adults is defined as BMI of ≥ 25 kg/m^2 and obesity is described as BMI of ≥ 30 kg/m^2 (Haslam & James, 2005; BMA, 2005). While there is a general consensus on using BMI for diagnosing overweight and obesity among adults, a similar international standard for children was, until recently, lacking (Cole et al., 2000; BMA, 2005). Because BMI of children changes drastically throughout childhood, BMI alone cannot be used for assessing the risk for obesity among youth (Cole et al., 1995). However, experts agree that when age is considered, BMI represents a helpful tool for assessing the risk of obesity not only in adults but also in pediatric populations (Freedman et al., 2005).

Currently, two sets of growth charts are commonly used to evaluate children's risk for overweight based on their BMI, including the 2000 CDC growth charts for American children and the new international cutoffs for body mass index for overweight and obesity (Kuczmarski et al., 2000; Cole et al., 2000). The latter classification system

was developed by the International Obesity Task Force (IOTF) and represents the first set of international standards for evaluating obesity in children aged 2 to 18 (Cole et al., 2000). The international cutoffs were calculated based on nationally representative data from six countries, including Great Britain, Netherlands, Brazil, Hong Kong, Singapore, and United States (Cole et al., 2000). In order to define overweight and obesity among children, the cutoffs are directly related to adult BMI of $\geq$25 and $\geq$30 kg/m^2 at age of 18 (Cole et al., 2000).

While internationally acceptable definitions of child obesity are necessary to monitor and compare obesity prevalence between countries, country-specific standards are often more sensitive measure of obesity trends in individual countries. As Vignerova et al. (2001) suggested, the new international standards of obesity tend to under-classify overweight children in a European region. When BMI-for-age of Czech 6 to 18 year old children was evaluated using both the international and the 1991 Czech reference data, the results showed that only 1% of children were classified as obese based on the international standard compared to 3% of children that were obese based on the Czech reference values (Vignerova et al., 2001). Because BMI-for-age was incorporated into the updated 2000 CDC growth charts, many researchers continue to use the U.S. standards either alone or in a conjunction with the new IOTF standards to avoid under-classification of obese children (Savva et al., 2002).

Social Cognitive Theory: Social and Environmental Influences on Children's Dietary Intakes and Body Mass Index

Child obesity is a complex issue that cannot be explained by one single nutrient or behavior. Because the behaviors and attitudes learned in childhood are likely to persist throughout adult life and will likely have a significant impact on an individual's BMI, it is crucial for researchers to identify and explain factors that influence children's dietary intake and food choices (Kelder et al., 1994). Several studies have found that personal characteristics such as taste and food preference do not explain dietary behaviors in children and are poor predictors of BMI (Domel et al., 1996; Resnicow et al., 1997). Similarly, awareness and knowledge of the benefits of exercise does not lead to greater physical activity among children (Caballero et al., 2003). Interestingly, several research studies by Cullen et al. (2000a,b) and others involving multiracial groups of children and parents indicated that environmental factors, such as food availability and amount of time spent watching television, have a strong influence on children's dietary behavior. Furthermore, social influences, such as parental behaviors and parent-child interactions within a child's environment are extremely important because the majority of dietary behaviors develop within a family context early in children's life (Cousins et al., 1993).

In the U.S., a number of social and environmental factors have been associated with healthier dietary behaviors among American children (Olvera-Ezzell et al., 1990; Cullen et al., 2000b). Because the low obesity rates among Czech children cannot be explained by the traditional diet or by the recent influx of Western dietary trends into the country, children's food intakes may be influenced by some of the social and

environmental factors, such as parental behaviors and food availability at home. In order to identify and explain a variety of personal, social and environmental factors that influence children's dietary intakes and BMI, our study was guided by a theoretical framework known as Social Cognitive Theory.

Social Cognitive Theory (SCT) seeks to explain the mechanisms of human behavior and describe the processes that can be used to achieve successful behavioral changes within individuals. This complex theoretical framework originated from Social Learning Theory, which was developed by Miller and Dollard in the early 1940's (Miller & Dollard, 1941). In the 1970's, Albert Bandura introduced a model of reciprocal determinism which emphasized that human behavior is the result of constant, triadic and dynamic interactions between behavior, personal characteristics and the environment (Bandura, 1978). Bandura proposed that many factors determine human behavior and a change in one of the factors often leads to a change in other factors. Thus, reevaluation of all the interactions between behavior, personal factors and the environment is often necessary. By building on the original ideas of Social Learning Theory and synthesizing the model of reciprocal determinism with concepts such as self-efficacy, outcome expectations and reinforcement, Albert Bandura introduced the comprehensive framework for understanding human behavior and behavioral change known as Social Cognitive Theory (Bandura, 1986). This behavioral theory not only identifies and describes major determinants of human behavior, but it also explains cognitive, behavioral and emotional processes related to behavior change and suggests ways to positively alter the behaviors of individuals.

Since its development, SCT has been extensively used for developing health education programs and nutrition interventions (Bandura, 1986; Sheeshka et al., 1993; Shannon et al., 1990). The first health-related intervention based on SCT principles was implemented in 1977 and targeted heart disease prevention in individuals (Farquhar, 1977). Other health and nutrition programs using SCT followed and this theoretical approach has been successfully used in designing and planning health interventions by many researchers and health educators. For instance, Rinderknecht & Smith (2004) successfully used the SCT construct of self-efficacy to decrease fat and sugar intake of 5 to 10 year old children in a 7-month after-school intervention. Similarly, Rankins et al. (2005) attempted to reduce hypertension in a group of low-income African American adults using a weekly program that was guided by SCT. The program focused on influencing SCT constructs such as expectancies and self-efficacy, and resulted in a significant decrease of blood pressure among individuals in the intervention group (Rankins et al., 2005). The major constructs of SCT are described in detail below.

Major Constructs in the Social Cognitive Theory

In order to understand human behavior and the processes of behavior change, researchers and health care professionals must focus on the interaction of various concepts within people's cognition and environment (AbuSabha, 1998). Over the last several decades, Mischel (1973) and Bandura (1977, 1986) proposed several concepts that form the foundation of the SCT (Glanz et al., 1997). Because these interacting concepts determine human actions, they are extremely important for understanding why

individuals engage in certain behaviors, as well as for understanding the processes related to a behavioral change. Among the most important constructs of SCT are self-efficacy, outcome expectations and expectancies, behavioral capability, perceived behaviors of others (also called observational learning), environment, reinforcements, and reciprocal determinism.

Self-efficacy. Self-efficacy refers to the personal judgment of an individual that she or he can achieve something and believe in his or her skills and abilities to adopt a particular behavior (Bandura, 1986). In another words, self-efficacy represents a person's confidence in performing a specific behavior (Glanz et al., 1997). Self-efficacy often determines the level of intention, effort and performance outcome that an individual invests into engaging in a behavior (Ewart et al., 1983). Therefore, self-efficacy is directly correlated to outcome expectations and has very strong potential in initiating and directing a behavior change. For example, Parcel and Edmundson (1995) found that self-efficacy was a major predictor of intention to make healthy food choices among third and fourth graders. Health educators often use traditional learning techniques such as observational and participatory learning to increase self-efficacy in individuals (Bandura, 1986). In this context, as an individual gets more confident and skilled in a certain task, his/her performance expectations rise, and in turn, affect the individual's self-efficacy (Glanz et al., 1997). The key for improving individuals' skills and self-efficacy is to proceed in small steps so that confidence is built gradually and the activity does not overwhelm a person.

Outcome Expectations and Expectancies. Outcome expectations are directly related to the concept of self-efficacy. When a behavior occurs repeatedly, an individual

develops certain expectations of the results of specific behaviors. However, people also develop certain outcome expectations, even for behaviors that are new to them, prior to experiencing a real outcome of that particular behavior (Glanz et al., 1997). These premature outcome expectations develop due to previous experiences with similar behaviors, observing others, hearing about a similar situation from others, or experiencing physiological or emotional reactions to a behavior (Glanz et al., 1997). Another concept that is fundamental to the SCT is "outcome expectancies," which represent the value an individual places on the outcome of a specific behavior (Glanz et al., 1997). In real-life situations, health educators should focus on assessing outcome expectancies prior to changing a behavior so that specific motivators are identified for each individual. Often, a behavioral change is more likely to occur within individuals either by emphasizing the short-term "negative" or "positive" effects of a particular behavior (Glanz et al., 1997).

Behavioral Capabilities. Behavioral capabilities also play an essential part in understanding behavior change processes. Any behavior change requires an individual to have certain knowledge, familiarity and skills that are directly related to that particular behavior (Glanz et al., 1997). Behavioral capabilities are usually developed through skills training, intellectual capacity and learning style (Glanz et al., 1997). Because behavioral capabilities represent the actual skills and knowledge that a person uses to perform certain tasks, skills training and active learning have a great potential to increase the likelihood of a behavior change by improving the individual's self-confidence, self-efficacy, and positive outcome expectations.

Reinforcement. In contrast to the original Social Learning Theory, Bandura and others proposed that individuals can change their behaviors not only through receiving a direct reward for their behavior, but also through observing other peoples' behaviors and through seeing them receive incentives for their actions. Thus, the concept of "perceived behaviors of others" (also called "observational learning") became a major construct within the SCT and was later identified by Bandura as "vicarious learning" (Bandura, 1972, 1986). Under the concept of observational learning, modeling plays an important role in influencing individuals and initiating behavior changes. Interestingly, modeling effects can be often seen among family members who adopt similar behaviors through observing each other over the course of years (Glanz et al., 1997).

According to the SCT, there are three types of reinforcement that may influence human behavior and behavior change processes: direct reinforcement, vicarious reinforcement, and self-reinforcement (Glanz et al., 1997). Furthermore, these reinforcements can be either external or internal, depending on the source of reinforcement (Lepper & Green, 1978). In order for an individual to undergo a successful behavior change, an internal reinforcement should be present. If only external rewards are imposed on an individual, the internal motivation and personal interest of an individual to engage in a particular behavior may decrease and lead to a failure (Lepper & Green, 1978). Therefore, nutritionists should be careful not to overemphasize the external reinforcement by giving excessive financial incentives to individuals involved in intervention programs and other projects (Glanz et al., 1997). In order to motivate a person to perform a certain behavior, self-reinforcement skills such as goal setting,

monitoring of a new behavior and self-reward for achieving a personal standard can be incorporated into intervention designs.

Certain food socialization practices used by parents may serve as a type of reinforcement within a family environment. According to Birch & Fisher (1998), the degree to which parents control their children's food intake is correlated with potential obesity. Thus, certain food socialization practices may positively or negatively influence the development of children's food preferences and dietary behaviors (Olvera-Ezzel et al., 1990; Cousins et al. 1993; Birch, 1998; Birch & Fisher, 1998). According to Cousins et al. (1993), food socialization practices reflect parental beliefs about foods and thus influence children's dietary behaviors and the development of food preferences. Previous research has shown that use of positive encouraging practices to like a particular food is most successful in stimulating the child's interest in the food (Olvera-Ezzel et al., 1990). This approach is effective, in part, because it encourages the consumption of a particular food within a positive social context (e.g. "this food will make you strong"; "this food is delicious"). Parents who use reasoning and try to explain the benefits of a particular food are more likely to be effective in encouraging their child to consume the targeted food, in contrast to those who use coercive feeding techniques (Cousins et al., 1993; Olvera-Ezzell et al., 1990).

Environmental Factors. Within the SCT, environmental factors are also believed to significantly affect human behavior and behavior change processes. Environmental factors are defined as any factor influencing a behavior that is external to an individual (Glanz et al., 1997). Two types of environmental factors may have substantial influence on human behavior and behavioral change: social and physical environmental factors. In

terms of social environment, family members, peers and friends are the most immediate individuals whose actions, opinions and thoughts are directly related to a person's behavior.

Parenting style is a method parents use to change or adjust a child's behaviors (Cullen et al., 2000b). Three general parenting styles have been identified in previous research: authoritative, authoritarian and permissive (Baumrind, 1967, 1971). Parenting style is determined by the degree of demandingness and responsiveness of parents (Maccoby & Martin, 1983). Permissive parents tend to be more responsive than demanding to a child's needs and more lenient than other parents (Baumrind, 1991b). Authoritarian parents pose high demands on a child but tend be less responsive to the child's needs (Baumrind, 1991b). Lastly, authoritative parents use parenting techniques that represents well balanced combination of demandingness and responsiveness (Baumrind, 1991b).

Authoritarian and permissive parenting styles have been shown to be negatively correlated with children's self-control as they relate to dietary habits and other health behaviors (Patock-Peckham et al., 2001; Birch & Fisher, 1995; Baumrind, 1967). Parents using authoritarian style tend to be highly controlling and often expect complete obedience from their children (Brannen & Fletcher, 1999). However, several studies have indicated that coercive feeding practices used by authoritarian parents to promote the consumption of a particular food often leads to opposite outcomes (Birch & Fisher, 1995). In fact, the restriction of various foods often heightens children's desire for those particular foods (Fisher & Birch, 1999a; Birch, 1980). In a study by Fisher et al. (2002), parental pressure was associated with lower intakes of fruits and vegetables by children.

Moreover, the coercive behavior of parents was directly correlated with children's high dietary fat consumption (Fisher et al., 2002). Examples of coercive behaviors commonly used by parents include rewarding a child with a favorite food or punishing a child by withholding his or her favorite food (Birch & Fisher, 1998; Birch, 1980; Birch et al., 1982).

In contrast, an authoritative parenting style has been shown to be most successful in encouraging good dietary behaviors in children (Anliker et al., 1990). Parents using an authoritative style are able to implement good discipline strategies while providing their children with a loving environment in which age-appropriate explanations and reasoning are used to encourage, restrict or moderate a child's food intake (Querido et al., 2002; Brannen & Fletcher, 1999; Baumrind, 1991a; Baumrind, 1971). The positive role of authoritative parenting style on dietary intakes and physical activity of children has been demonstrated in several studies in the U.S. as well as Europe (Schmitz et al., 2002; Nicklas et al., 2001c). A study with 3,798 seventh grade students showed that girls whose mothers reported using an authoritative parenting style were more likely to be physical active and less likely to engage in sedentary behaviors compared to other children (Schmitz et al., 2002).

Similarly to social influences, there are many physical environmental factors such as food availability and food accessibility that may influence individuals' actions and behavior change (Glanz et al., 1997; Cullen et al. 2000b). For example, some people do not consume adequate servings of fruits and vegetables because such foods are not available in their home or workplace. In the last several decades, awareness of the role of environmental factors in understanding human behavior has increased within the

scientific community and numerous research projects and intervention programs have incorporated these environmental factors into their designs and planning.

Menu planning, grocery shopping practices and food availability represent important environmental influences that have strong impacts on dietary behavior and food choices of children. Through planning menus, purchasing nutrient dense foods and preparing nutritious meals at home, parents are key players in creating an environment in which children can learn and adopt healthy dietary behaviors and food preferences (Davison & Birch, 2001; Cullen at al., 2000b; Hearn et al., 1998). In contrast, research shows that if children are exposed to unhealthy foods within their family and school environment, they may develop physiological preference for foods that are high in energy, fat and refined sugar (Birch & Fisher, 1998). Thus, parents can increase their children's consumption of healthy foods by purchasing a variety of fruits and vegetables on regular basis, by including them frequently in children's snacks and by making them accessible at home (e.g., storing cut up fruit in a refrigerator). It is important to note that the creation of this environment requires parents to have at least a minimum knowledge of health and nutrition (e.g., what foods have high nutrient density and low fat content). Similarly, food availability at home reflects food choices of the family members and encourages or discourages consumption of various foods (Hearn et al., 1998). Hearn et al. (1998) found that children are likely to consume more fruits, juice and vegetables if they are available and accessible at home and at school.

Family meals also play an important role in influencing children's dietary habits during childhood (Golan & Crow, 2004). Gillman (2000) found that the dietary quality of 9 to 14 year old children was significantly higher among children who had frequent

family meals at home compared to children who ate most of their meals without their family.

Reciprocal Determinism. The SCT is based on the model of reciprocal determinism in which behavior, personal characteristics, and environment are constantly influencing each other and thus are determining human behavior and behavior change (Bandura, 1978). The idea of reciprocal determinism suggests that the processes associated with a behavioral change are very complex and that in order to understand them, nutritionists should be constantly reassessing various relationships between the concepts of SCT. In other words, to change a particular behavior, focus should not be placed only on that specific behavior but also on numerous emotional, cognitive and environmental factors that may be affecting an individual and his or her actions. For instance, nutrition-related interventions should consider all the factors that may be affecting individuals' behaviors, such as parents who often have a tremendous impact within the home environment or friends who may be a source of peer pressure or positive modeling (AbuSabha, 1998). Overall, the model of reciprocal determinism forms the foundation of the SCT and its use is essential for understanding the complex processes involved in a behavioral change.

Application of Social Cognitive Theory

Even though the SCT was developed based on research with predominantly white middle class Americans, the application of this theoretical framework is largely universal and helps explain human behavior and behavior change processes within a variety of

racial, ethnic, and cultural groups (Bandura, 2002; Cullen et al., 2000a). Because of its complexity, SCT is very useful for identifying and explaining factors that influence dietary and exercise behaviors among children. The use and application of Social Cognitive Theory helps explain behaviors and allows educators to design effective interventions that may improve children's dietary and physical activity habits.

The usefulness of the SCT in nutrition-related research with a diverse sample was shown in several studies conducted by Cullen et al. (2002a,b) and others. In a study by Cullen et al. (2002a) the application of SCT identifies important differences in environmental construct of the SCT between diverse groups of children and parents. For instance, Euro-American parents were found to use less permissive parenting practices and encouraging expectancies than Hispanic American parents. In contrast, Euro-American parents tended to engage in meal planning more often than Hispanic parents. While there is a lack of research directly investigating the application of SCT in cross-cultural research, Albert Bandura, the author of SCT suggests that some constructs such as self-efficacy are universal and applicable across cultures (Bandura, 2002). According to Bandura (2002, p.3), "Social Cognitive Theory is well suited to elucidate human personal development, adaptation, and change in diverse cultural milieus."

Despite its effectiveness in nutrition-related practice and research, it is important to acknowledge that the application of SCT poses some limitations in cross-cultural research. First, because SCT suggests that a behavior change results from reciprocal determinism, a continuous interaction between personal, behavioral and environmental factors, SCT should be applied in its full range in order to account for the relationships between constructs (Bandura, 1978). However, descriptive studies have shown that

individual constructs of SCT, such as the environmental construct, may be successfully used to explore and identify factors influencing children's dietary intakes and physical activity (Cullen et al. 2000b; Neumark-Sztainer et al., 2003b). Second, cultural factors that are directly influenced by historical developments of a society may significantly impact the evolution of dietary patterns in different cultures (Molaison et al., 2005). Thus, the influence of the SCT constructs on dietary intakes of individuals may depend on the cultural and historical context in which individuals develop dietary habits. Another example of a SCT limitation may be caused by differences in the socioeconomic status of various cultural groups (Molaison et al., 2005). Food choices and physical activity patterns may be influenced by different factors among individuals from different cultures due to diverse cultural backgrounds and living conditions.

Summary

Obesity-related research has identified a number of possible causes of obesity in the last two decades, including excessive intakes of energy and fat, decreased physical activity and increased consumption of fast foods by American children. While some nutrition interventions to reduce the incidence of obesity produced moderately positive results, the majority of the interventions were unsuccessful, in part because of a lack of understanding of factors that influence children's dietary intakes and BMI. Obesity-related interventions have been, until recently, limited to one or two factors that influence children's body weight, such as physical activity and fruit consumption, while the influence of other variables on children's BMI was ignored. Despite numerous efforts to

decrease child obesity rates on the national, state and local level in the U.S., the number of "overweight" and "at risk for overweight" children continues to rise.

Based on the SCT, human behavior, including children's dietary choices, is influenced by numerous constructs that can reinforce or discourage certain behaviors. Among these constructs are personal characteristics such as self-efficacy and outcome expectations, but also a variety of external constructs that can be directly influenced by parents, peers, school teachers and other individuals within a child's environment.

Czech children have significantly lower BMI than American children (Lissau et al., 2004). Because the Czech traditional diet is high in energy and fat, and Czech children are increasingly exposed to fast food restaurants, it is surprising that their BMI is lower. Thus, it is possible that Czech children's food choices are influenced by other social and environmental factors that differ from those influencing American children. For instance, Czech parents may be using a different parenting style that supports healthier eating habits or Czech children may be engaging in more exercise. Unfortunately, data on dietary intakes and physical activity among Czech school-aged children is very limited.

To our knowledge, no studies have explored the differences in the personal, social and environmental factors that influence children's BMI between the U.S. and a country with significantly lower obesity rates. The results of this cross-cultural study will help nutrition professionals understand the various factors that may positively influence children's body weight and design new obesity prevention and/or reduction interventions.

CHAPTER III

METHODOLOGY

Research Design and Sampling Procedures

This cross-cultural quantitative study was based on a cross-sectional, correlational design. The target populations of this study were school-aged children attending fourth, fifth, or sixth grade and their parents in the Czech Republic and in the U.S. Recruitment of the subjects was conducted directly through elementary and/or middle schools. The sample size estimation was based on R^2 of 0.3 and power of 0.8 using ten independent variables in a regression model at p=0.05 (Portney & Watkins, 2000). The value of R^2=0.3 used for the sample size estimation was obtained from previous research on the predictive effect of maternal obesity on children's BMI (Salbe et al., 2002; Whitaker et al., 1997). The estimation suggested a total sample size of 45 children and their parents (fathers only if primary care takers). Only healthy children attending fourth, fifth or sixth grade qualified for the study. Children who suffered from a chronic disease or any other condition that may influence their dietary intake or physical activity were excluded from the study after the data collection. The study was approved by the Institutional Review Board at Oklahoma State University (Appendix A) and the Ethical Institute of the Charles University in Prague (Appendix B).

Sampling Procedure

A cluster sampling technique was utilized to recruit parents and their children in one U.S. city (Oklahoma City) and two Czech cities (Pilsen and Prague). In the U.S., a list of all elementary and middle schools in the chosen county was obtained from the Oklahoma State Department of Education. In order to control for extreme variations in socioeconomic status between American schools and allow for a cross-cultural comparison, all schools with less than 10% or more than 90% of children receiving free or reduced lunch were excluded before the school sample was randomly selected (Oklahoma State Department of Education, 2005). A similar sampling technique was used in the Czech Republic. A list of all elementary schools in Pilsen was obtained from a phonebook and several schools were randomly selected. In Prague, one elementary school was selected using convenience sampling. Because elementary schools in the Czech Republic vary minimally in terms of the children's socioeconomic status, no schools were excluded before the school selection began.

Subject Recruitment

After elementary and middle schools were randomly selected, the principals of the selected schools in both countries were contacted by phone and the nature of the study was explained to them. An informed written consent was obtained from the principals at each of the selected schools (Appendix C). Due to the differences in educational structure, the procedures for parent recruitment varied to some degree in the U.S. and the

Czech Republic. In both countries, teachers collaborated with the investigators by communicating with children and parents and by distributing the Parent Questionnaires to parents. If a parent had more than one child eligible for the study, the parent was asked to specify which child should be included in the study. A copy of the written consent form was given to each parent (Appendix D).

United States. A detailed description of the study, a parental written consent form (Appendix D), and the Parent Questionnaire (Appendix F) were distributed to parents through their children. Parents who were interested in participating were asked to return a signed written consent form and the completed Parent Questionnaire to a teacher through their child within four days.

Czech Republic. Parents were informed about the study and asked to participate with their child during a parent meeting at school. If they agreed to participate, they were asked to complete the Parent Questionnaire either during a parent meeting or at home and return it to a teacher through their child within four days. If parents were not present at the parent meeting, a detailed description of the study and a written consent form was sent home through their child.

In both countries, lists of all eligible fourth, fifth and sixth graders were created after obtaining written consent and the completed Parent Questionnaires from participating parents. Two school visits on two separate days (at least two days apart) were scheduled with the principals and teachers from the participating schools. All fourth, fifth and sixth graders whose parents gave permission for their participation were asked for an assent to take part in the study prior to any data collection (Appendix E).

Data Collection, Procedures and Instrumentation

Data Collected from Parents. Information from parents was collected using the Parent Questionnaire (Appendix F). The questionnaire included detailed instructions on how to complete the questionnaire and contained the contact information for the primary investigator. Parents were asked to report their weight and height. Because parental obesity dramatically increases the risk of obesity in children under 10 years of age (Whitaker et al., 1997), these self-reported data were used to calculate parental BMI as wt/ht^2. Along with socioeconomic and demographic data such as age, gender, occupation, and education, several other variables were obtained from the questionnaire. Parents were asked to answer questions related to their parenting style, food socialization practices, food preparation and meal planning behaviors, and grocery shopping practices as they related to their child's food intake. The scales measuring these variables were adopted from previous research by Cullen et al. (2000b) (Appendix F). Parents were asked to answer questions about these practices using the options of "never, sometimes, often and always."

Parents were also asked to evaluate their child in terms of perceived and ideal body size. Parents' body image perceptions of their child's weight were measured using a body image instrument that was successfully used in previous research (Collins, 1991) (Appendix F).

Another parental variable included in this questionnaire was the availability of healthy foods, such as low-fat foods, fruits, and vegetables found in each household. This variable was estimated from the Shelf Inventory (Appendix F) (Crockett et al.,

1992) that was a part the Parent Questionnaire. Previous research indicated that the shelf-inventory had a 86% sensitivity and 92% specificity and represented a valid measure of food availability in households (Crockett et al., 1992). The instrument was modified from the original version for Czech children by adding typical foods consumed in the Czech Republic. Research by Hearn et al. (1998) found that food availability in household plays a role in children's consumption of specific foods. Therefore, this variable helped indicate whether there were significant differences in the type of foods found in American and Czech households. Parents were asked to mark either "yes" or "no" when asked about specific foods found in their households (Appendix F). Moreover, the Shelf Inventory aided in validating the 24-hour recalls collected from the children.

After collecting the completed Parent Questionnaires from parents, the questionnaires were coded and parent's names were removed from the questionnaires to protect confidentiality of the subjects.

Data Collected from Children. During the study, children's height and weight, dietary intakes, physical activity, and body image perceptions were collected using a variety of instruments. Prior to data collection, children were asked to sign an assent form for their participation in the study (Appendix E).

The research instruments included the multiple-pass 24-hour recall, the Self-Administered Physical Activity Checklist (SAPAC) (Appendix G), and Body Image instrument (Appendix H). The SAPAC was developed and validated by Sallis et al. (1996) and represents a 24-hour recall of 25 physical activities and sedentary behaviors such as watching television and playing video games (Appendix G). To eliminate

potential error associated with children completing the SAPAC on their own, the physical activity checklist was completed by the main investigator or a trained researcher. Activities that were not included on the SAPAC list of activities were recorded under "other activities." Data from children were collected on two separate days in order to obtain better estimates of dietary intakes and physical activity of each child. Four volunteer research assistants assisted with collecting data from children in both countries. Prior to any data collection, the assistants were given a detailed description of the study and were trained on how to measure children's height and weight, and how to complete the multiple-pass 24-hour recall, the modified SAPAC and Body Image instrument with children.

On the first day of data collection in schools, children completed one multiple-pass 24-hour recall, the Body Image instrument (Appendix H), and the modified SAPAC (Appendix G) with the help of the investigator or one of the research assistants. Children's height and weight were measured in the morning hours at each school and children's privacy was ensured during measurements. Children's weight was measured using an electronic scale (Taylor Precision Performance, Oak Brook, Illinois, USA) with a stable weighing platform. Children were weighed lightly dressed and without shoes. Children's weight was measured in kilograms to the nearest 100 grams while their weight was equally distributed on the scale. Children's height was measured using a flexible tape while their head, back, and buttocks were touching a vertical wall behind them. Height measurements were taken to the nearest 0.5 centimeter. Both measurements were performed according to the CDC recommendations for measuring stature in children and adolescents (USDHHS, 2006).

One multiple pass 24-hour recall was conducted with each child individually on the first day of data collection. Plastic food models, real food examples, bean bags and household measuring tools (cups, tablespoons, glasses etc.) were used to stimulate children's memory and thus improve the quality of the 24-hour recall. After children recalled the foods and beverages they consumed in the previous 24 hours, the primary investigator or the research assistant asked additional probing questions. Finally, children were asked to give a better description and estimation of serving size of a specific food item. The children were also asked to recall any snacks or condiments they consumed within the same 24 hour period. The use of a 24-hour recall was shown to be a valid method of estimating energy and macronutrient intakes of children as young as 8 years of age in previous research (Lytle et al., 1993; Johnson et al., 1996).

In addition, children answered two questions related to their body image perceptions using the same Body Image instrument that was included in the Parent Questionnaire. The questions were adapted from a study by Collins (1991) and slightly modified. Each child was asked to look at several pictures of different body sizes and specify which body size corresponded to their current body size and which picture represented their favorite body size. In addition, children were asked to mark their response on an interval scale ranging from 1 to 7 that was underneath the pictures (Appendix H). The two questions were as followed: "Which picture below represents the body shape you think most looks like you?" and "Which picture below represents the body shape you think looks closest to your favorite body shape for a girl/boy your age?"

Lastly, children were asked to recall what activities they were engaged in on the previous day using the modified SAPAC. Children were asked to recall what activities

they participated in, and how long they spent in individual activities, and rated their perceived effort as light, moderate or strenuous. The modified SAPAC was completed as a 24-hour recall of physical activity.

On the second day of data collection, the second multiple pass 24-hour recall was completed with each child using the same procedures as during Visit 1. Children also completed the modified SAPAC with the help and guidance of the primary investigator or the research assistants.

Study Variables & Measurements

Parents. Information collected from the Parent Questionnaires was used to measure and compare several variables between American and Czech parents. In addition to parental age, gender, education, occupation and household income, parents' self-reported height and weight were used to calculate parental BMI as wt/ht^2. Household income reported by parents in both countries was classified into two categories: "below average" and "above average." Because the mean household income in Oklahoma county in 2004 was $50,378, all American households with income below $50,000 were classified as "below average" (US Census, 2004). The mean household income in the Czech Republic in 2004 was Kc 20,061 (Czech crown), thus all Czech households with income below $20,000 were classified as "below average" (Ministry of Industry and Trade of the Czech Republic, 2005). The educational level of parents was analyzed in four different categories, including elementary, vocational, secondary and university education.

The questionnaire also included five scales that measured parenting style (16 items), encouraging food socialization practices (13 items), discouraging food socialization practices (13 items), food preparation at home (10 items), and meal planning/grocery shopping practices (8 items). These socio-environmental scales were previously validated and their reliability was measured by Cullen et al. (2000b). Karen Cullen granted permission to use the scales in the spring of 2005 (personal communication). For each item, parents were given the following choices: "never, sometimes, often, and always." The scales were slightly modified for the study because they were originally developed for measuring socio-environmental influences on children's fruit, juice and vegetable intake (Cullen et al., 2000b) rather than overall food intake. Because the scales were modified and used to compare socio-environmental influences in a culturally diverse sample, parents' responses to the items were analyzed using factor analysis. The analysis was performed with the total sample of 132 American and Czech parents. To determine whether the responses from parents on each scale were suited for factor analysis, Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy and the Bartlett's tests of sphericity were conducted (Stevens, 2002). KMO values of >0.6 within the correlation matrix were considered adequate for obtaining a factorable solution. To determine whether the correlation matrix was significantly different ($p<0.05$) from an identity matrix, Bartlett's test of sphericity was evaluated.

Principal component analysis with varimax rotation was used to analyze each scale. Principal component analysis allowed for the evaluation of the correlation matrix and helped identify items that shared common correlations with each other. Because factor loadings represent the Pearson Product Moment Correlation of the item with the

factor, items that shared common correlations were expected to load on the same factors. Items that loaded at 0.4 or higher were included in the final scales (Stevens, 2002). Loadings of 0.4 and higher that loaded on two or more factors were removed from the scales. Because the parental responses to each item ranged from 1 to 4, the mean and standard deviation was calculated for each extracted factor. Prior to calculating the means and standard deviations, negative factor loadings were reverse recoded because they represented a negative relation of the variable to the factor. Cronbach's alpha was calculated for each scale in order to evaluate internal consistency of each item. Cronbach's values below 0.5 were considered poor, values between 0.5-0.75 were considered moderate, and values above 0.75 were considered desirable measures of internal consistency (Portney & Watkins, 2000).

Parental perceptions of their child's actual body size and ideal body weight were measured using the Body Image instrument (Appendix H). The values of perceived and ideal body image perceptions represented interval variables and ranged from 1 to 7.

Parents were also asked to complete the Shelf Inventory instrument. The data from this instrument was used to calculate the number of specific healthy foods that were available in American and Czech households. Because the availability of low-fat meats and the use of salad dressing is very limited in the Czech Republic, healthy food items were defined as specific low- or non-fat dairy product, fruit or vegetable.

Children. In addition to demographic information, several variables were measured based on the information collected from children, including dietary intakes, frequency of dining in fast food restaurants, the amount and type of physical activity, and body image perceptions. All foods and beverages obtained from the 24-hour recalls were

analyzed using the nutrient analysis software Food Processor (Food Processor 8.4, 2005). The Food Processor database is based on the typical American diet and contains more than 22,000 different foods and beverages (Food Processor 8.4, 2005). To perform an adequate nutrient analysis of the 24-hour recalls of Czech children, the recipes of traditional food items were entered into the database. In terms of dietary intakes, the amount of energy and fat, and energy derived from fat were obtained from two multiple pass 24-hour recalls conducted with each child. The average amount of the two variables was measured as the amount of kilocalories, grams of fat, and percent of calories from fat.

Other dietary variables were children's fruit and vegetable consumption, and the frequency of dining in fast food establishments. Children's average intake of fruits, vegetables, and frequency of dining in fast-food restaurants was estimated. Because a hand calculation based on the Food Guide Pyramid servings has been shown to be a valid measure of children's fruit and vegetable intake in previous studies (Domel et al., 1994; Cullen et al., 1999), a two-day average consumption of fruits and vegetables was calculated for each child from the 24-hour recalls. The MyPyramid developed by the United States Department of Agriculture in 2005 was used as a guide for calculating an average number of cups of fruits and vegetables each child consumed for the two separate days (USDA, 2005). In addition to fruit and vegetable consumption, the 24-hour recalls were used to estimate children's frequency of dining in fast food establishments. Each time a child visited a fast food restaurant during the two days of data collection, it was counted as one visit, regardless of how many items children ordered and consumed at that

time. The frequency of dining in fast food establishments was reported as the number of visits per two days.

Metabolic equivalents (METs) were assigned to all of the physical activities reported by children. One metabolic equivalent is defined as the ratio of the work metabolic rate to the resting metabolic rate (Ainsworth et al., 2000). One MET is equal to the amount of oxygen per kilogram of body weight per minutes that is consumed when sitting quietly, which is equal to 3.5 ml/kg/min or 1 kcal/kg/hour. All of the activities in which children participated were assigned specific METs based on the updated Compendium of Physical Activities developed by Ainsworth et al. (2000). A two-day average amount of METs expanded by each child was calculated.

An average amount of minutes that each child spent in moderate, vigorous, and moderate and vigorous activities was also calculated using METs. Moderate activity was defined as any physical activity during which children expanded 3-6 METs. Vigorous activity was defined as any activity with METs of greater than 6 (Ainsworth et al., 2000). In order to obtain an average amount of time children were either moderately or vigorously active, the amount of time (in minutes) when children were moderately or vigorously active was added and a two-day average was calculated for each child. Lastly, the number of minutes spent in moderate and vigorous activities was combined to obtain a two-day average of overall physical activity.

While the evaluation of perceptions and feelings regarding weight and desired body size among children is difficult, several methods have been developed, including the presentation of drawings of same-sex body size ranging from “very thin to very heavy” (Coughlin et al., 2003). Children’s perceived and ideal body image in this study

was measured using the same Body Image instrument that was used in the Parent Questionnaire.

Lastly, Body Mass Index was calculated as wt/ht^2 from children's weight and height measurements. The percentile of Body Mass Index was calculated for each child using age and gender specific growth charts developed by the U.S. Centers for Disease Control and Prevention (CDC, 2002). The CDC growth charts were also used to classify children as normal weight (5^{th}-84^{th} percentile), at risk for overweight (85^{th}-94^{th} percentile), and overweight ($\geq 95^{th}$ percentile). In addition to the CDC growth charts, the Czech reference values for child overweight (90^{th}-97^{th} percentile) and obesity ($>97^{th}$ percentile) were used to compare the prevalence of obesity between American and Czech children (Lhotska et al., 1993). The number and percentage of children who were at risk for overweight and overweight were calculated for both countries.

Statistical Analysis

Descriptive Statistics

Descriptive statistics were used to describe the sample in terms of children's age, gender, grade, BMI-for-age, dietary intakes, body image perceptions and physical activity. Parental age, education, income and BMI status were also reported.

The Statistical Package for Social Sciences (SPSS 12.0, version for Windows, 2003) was used to conduct statistical analyses in this study. The level of significance was set at 0.05 for all statistical tests performed in the study.

Hypotheses

Hypothesis 1: Dietary intakes of American children are significantly higher in total energy, grams of fat and energy derived from fat compared to Czech children.

Hypotheses 2: American children consume less fruits and vegetables (in cups) than Czech children.

Hypothesis 3: American children dine more often in fast food restaurants than Czech children.

The data obtained from the multiple pass 24-hour recalls served as a primary tool for assessing children's 2-day average intakes of energy, fat and energy intake from fat and the number of cups of fruits and vegetables. In addition, the frequency of dining in a fast food restaurant fast-food was analyzed consumed by the school-aged children in the Czech Republic and the U.S. Dietary intakes of American and Czech children were compared using two-tailed independent t-tests.

Hypothesis 4, 5 & 6: The ideal body image selected by American children is significantly smaller (thinner) than the ideal body image selected by Czech children. American children perceive themselves heavier compared to Czech children. There will be a significant difference in the ideal body image between American child-parent pair; no significant difference will be observed between Czech child-parent pairs.

The reported values of perceived and ideal body image (ranging from 1-7) between American and Czech children and parents were compared using two-tailed independent t-tests. In addition, paired t-tests were used to determine the differences in perceived and ideal body image within child and parent pairs.

Hypothesis 7: American children spend significantly less time (minutes) in moderate and vigorous-type physical activities compared to Czech children.

The total number of minutes spent in moderate-type activities (3-6 METs), vigorous-type activities (>6 METs), and combined moderate and vigorous activities were compared between American and Czech children using two-tailed independent t-tests.

Hypothesis 8 & 9: American parents score lower on authoritative parenting scale compared to Czech parents. American parents are significantly less involved in their child's food/meal preparation than Czech parents.

Using the total sample of parents, factor analysis with each of the 5 socio-environmental scales was performed in order to obtain subscales for parenting styles, encouraging food socialization practices, discouraging socialization practices, food preparation practices, and menu planning/grocery shopping practices. Individual scores on each factor were then calculated for each parent

and compared between American and Czech parents using two-tailed independents t-tests.

Hypothesis 10: A lower amount of healthy foods are available in American households compared to Czech households.

The availability of several healthy food items (specific low- or non-fat dairy products, fruits & vegetables) was measured using the Shelf Inventory and compared between American and Czech households using Chi-square tabulation.

Hypothesis 11: Children's BMI-for-age is significantly predicted by nationality (U.S. or Czech), parental BMI and education, children's energy and fat intakes; fruit and vegetable intakes in cups; minutes of moderate and vigorous physical activity; parenting style (positive or negative); encouraging food socialization practices, and food preparation behaviors by parents.

A multiple regression model was used to assess the effect of a variety of dietary, physical activity and social and environmental factors that may contribute to children's BMI-for-Age. To control for their confounding effect, parental education and children's gender were entered into the model first, followed by other variables.

CHAPTER IV

DIETARY INTAKES, PHYSICAL ACTIVITY AND PREDICTORS OF CHILD OVERWEIGHT AMONG 4-6TH GRADERS IN THE CZECH REPUBLIC

Abstract

Objective: To evaluate dietary intakes and physical activity, and identify important predictors of overweight in a sample of school-aged children in the Czech Republic.

Design: Correlational study with a cluster sampling design.

Subjects: 97 fourth, fifth and sixth graders and their parents from two Czech cities.

Measurements: Two -24-hour recalls provided total amount of energy, fat, percentage of energy derived from fat, dietary fiber, and servings of fruits and vegetables. Physical activity was measured by the Self-administered Physical Activity Checklist (SAPAC) and activities were classified according to metabolic equivalents (METS).

Results: The prevalence of overweight and obesity among children was 11.3%. Children consumed less energy and dietary fiber than recommended by the Czech dietary recommendations. The proportion of energy derived from fat was 28.5%. Children's intake of 1.4 cups of fruit and 1.2 cups of vegetables was less than half the recommended

amount. Children met the recommendation of at least 60 minutes of physical activity a day. Children's younger age was the only significant predictor of higher BMI-for-age. **Conclusion:** Poor dietary quality may be responsible for the increasing rates of child obesity in the Czech Republic. Czech children do not consume enough fruits, vegetables, and dietary fiber. Nutritional professionals in the Czech Republic should focus on increasing consumption of fruits, vegetables, and other high-fiber foods in order to reduce the risk for overweight among Czech children.

Key words: Child overweight, dietary habits, physical activity, BMI-for-age

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Introduction

Child obesity has become a serious public health problem in many developed countries over the last several decades (World Health Organization, 2002). The current situation is serious because obesity has negative consequences on the health and nutritional status of children. Many studies have shown that overweight children are more likely to develop chronic diseases, such as cardiovascular disease, hypertension, and dyslipidemia (USDHHS, 1998; NIH, 1985). Increased adiposity and Body Mass Index (BMI) are also responsible for the onset of type 2 diabetes in children at a very young age (Fagot-Campagna et al., 2000; Harris et al., 1998; WHO, 2000).

The recent increases in child obesity rates are particularly serious because studies demonstrated that the majority of overweight children remain overweight or obese in

their adult years (Webber et al., 1995; Guo, et al. 1994; Whitaker et al., 1997). Up to 40% of 7-year old and 80% of 10 to 15-year old obese children remain obese as adults (Webber et al., 1995; Whitaker et al.,1997; Stransky, 2000). In general, many children with increased adiposity remain overweight for up to 20 years of their adult life which substantially increases their risk of developing a chronic disease (Serdula et al., 1993; Freedman et al., 1987).

Research in the U.S. and other Western countries identified a wide range of factors that may be contributing to increased body weight and adiposity among children (Paeratakul et al., 2003; Fontvieille et al., 1993). Excessive intakes of energy and fat, increased consumption of sweetened beverages, and low intakes of fruits and vegetables are often associated with higher BMIs among young children (Paeratakul et al., 2003; Neumark-Sztainer et al., 2003; Gray & Smith, 2003). Lack of physical activity and increased sedentary behaviors have also been linked to child obesity (Fontvieille et al., 1993). In fact, physical inactivity has been identified as one of the strongest correlates of child obesity (Barlow & Dietz, 1998; Seidell, 1995). In a study by Robinson (1999), television watching was significantly associated with children's decreased energy expenditure and increased appetite.

Parents play a crucial role in the reduction and prevention of obesity because children develop their taste preferences and dietary and exercise behaviors early in life (American Dietetic Association (ADA), 2004; Brannen & Fletcher, 1999). Parents have the ability to significantly influence children's food choices and dietary patterns (ADA, 2004). The strong influence of parents on children's food choices within the family environment is reflected in the fact that high parental BMI, low parental education, and

lack of available healthy foods in the home were found to be strongly associated with obesity among children in several countries (Savva et al., 2002; Lamerz et al., 2005).

Obesity rates among children have increased in many countries in the last three decades (WHO, 2002). While the United States has one of the highest rates of overweight among children in the world (22% overweight), the proportion of overweight children continues to rise in many other countries, including developing nations (Ogden et al., 2002; Martorell et al., 2000). A trend toward increased obesity rates has been observed among children in several European countries (Savva et al., 2002; Rolland-Cachera et al., 2002; Zimmermann et al., 2000; Bundred et al., 2001; Lissau et al., 2004). For example, Kromeyer-Hauschild et al. (1999) found that the proportion of overweight German girls increased from 11.7% in 1975 to 20.7% in 1995. The prevalence of obesity among children from Central and Eastern European countries, including the former Czechoslovakia, is generally lower than the U.S. and Western Europe (Silventoinen et al., 2004, Lissau et al., 2004). However, recent findings from the Czech Republic suggest that the proportion of overweight and obese children has recently increased in children (Lissau et al., 2004; Kobzova et al., 2004).

Findings from the 1991 and 2001 Czech National Anthropological Surveys (NAS) revealed that rates of overweight and obesity children increased in the age group that is most predictive of adult adiposity (ages 7-11). In 1991, 3% of Czech children were obese; by 2001, 5.6% of boys and 4.7% of girls were obese (Kobzova et al., 2004). A 1999-2000 study measured 7 to 11 year old children in 38 public schools in the Czech Republic (Kovarova et al., 2002). The findings revealed that 13.1% of boys and 11.9% of girls were overweight or obese in 1999 compared to 10% in 1991 (Kovarova et al.,

2002). These studies provide evidence that, despite relatively low child obesity rates in relation to other countries, the prevalence of overweight and obesity is rising among elementary school-aged Czech children.

The development of obesity among children in Western countries has been associated with a combination of personal, social and environmental factors (Andersen et al., 1998; Nicklas et al., 2001; Hill & Peters, 1998). Thus, it is likely that BMI of Czech children is influenced by similar factors, including dietary intakes, physical activity and parental behaviors. The Czech traditional diet is very similar to that of other Eastern and Central European countries (WHO, 2001). The diet is characterized by large amounts of meat and saturated fats, and by lower amounts of fruits and vegetables (Benesova & Havelkova, 1999; Filiberti et al., 1995). Czech 10-year old children were found to consume almost 35% of energy from fat while their intakes of vitamin C, vitamin A and calcium were below the recommended amounts (Soltysova & Bellisle, 1994; Parizkova, 2000). In addition to the low-nutrient dense traditional diet, the nutritional status of Czech children has been influenced by significant political, economic and social changes that have occurred in the last several years. While the influx of Western culture has brought several positive nutritional trends into the country such as a greater availability of healthy foods, children are increasingly exposed to negative dietary and lifestyle trends (Parizkova, 2000). An example of such negative Western trends is an increase in fast food consumption, frequent dining out, and a decrease in physical activity (Humenikova, 2003). Both the unhealthy nature of the Czech traditional diet as well as the influx of Western dietary trends may be contributing to the recent increases in the prevalence of obesity among Czech children.

While obesity rates among Czech children have been closely monitored in the last several decades, there is very limited knowledge about the major influences on body weight, dietary intakes and physical activity of Czech school-aged children (Parizkova, 2000). Understanding important predictors of obesity is crucial for developing comprehensive and effective obesity prevention programs for Czech children. Thus, the purposes of our study were to determine dietary intakes in terms of energy, fat, fiber, and fruit and vegetable servings; evaluate the amount and intensity of physical activity; and identify important predictors of overweight and obesity in a sample of Czech fourth, fifth and sixth grade children.

Methodology

This quantitative research was based on a cross-sectional, correlational study. A pilot study was conducted in the summer of 2004 with 16 school-aged children and their parents from one elementary school in the Czech Republic. Study procedures were modified slightly based on the pilot study test and data collection was conducted between May and June of 2005 in two Czech cities (Pilsen and Prague). The target populations were elementary school children in grades four, five, and six and their parents. The recruitment of children and their parents was conducted through four public elementary schools.

The schools were randomly selected using a cluster sampling technique. A list of all elementary schools was obtained from the Pilsen phonebook and ten schools were randomly selected for participation. One school in Prague was selected using

convenience sampling. Sample size estimation was based on R^2 of 0.3 and power of 0.8 using ten independent variables in a regression model at p=0.05 (Portney & Watkins, 2000). The value of R^2=0.3 used for the sample size estimation was obtained from previous research on the predictive effect of maternal obesity on children's BMI (Salbe et al., 2002; Whitaker et al., 1997). The estimation suggested a total minimum sample size of 45 children and their parents. The study was approved by the Institutional Review Board at Oklahoma State University and the Ethical Institute of Charles University in Prague, Czech Republic.

After the elementary schools were randomly selected, the principals of the schools were contacted by phone and the study was described to them. Informed written consent was obtained from the principals at each of the selected schools. Parents were informed about the study during the parent meeting at school and asked to participate with their child. The parents who agreed to participate were asked to complete a Parent Questionnaire during the parent meeting or home, and return it to the child's teacher within four days. If parents did not attend the parent meeting, a detailed description of the study and a written consent form was sent home through their children. If a parent had more than one child eligible for the study, the parent was asked to specify which child was included in the study. After obtaining written consent and a completed Parent Questionnaire from parents, two school visits on separate days (at least two days apart) were scheduled for data collection from children. Three trained Czech volunteer research assistants helped the investigator collect data.

Data Collection from Parents and Children.

The Parent Questionnaire requested the parent's age, gender, income, education and self-reported weight and height. Children whose parents gave permission for their participation were asked for assent to take part in the study prior to data collection. Information collected from children included height, weight, dietary intakes and physical activity. Children completed one multiple-pass 24-hour recall (Moshfegh et al., 1999) and a modified Self-administered Physical Activity Checklist (SAPAC) (Sallis et al., 1996) with the help of the investigator or research assistants during visits one and two. Plastic food models, real food examples, bean bags and household measuring tools (cups, tablespoons, glasses etc.) were used to stimulate children's memory and thus improve the quality of the 24-hour recall. After children recalled the foods and beverages they consumed in the previous 24 hours, the primary investigator or a research assistant asked additional probing questions. Finally, children were asked to give detailed descriptions and estimates of serving sizes of specific food items. The children were also asked to recall any snacks or condiments they consumed within the same 24 hour period. The use of a 24-hour recall was shown in previous research to be a valid method of estimating energy and macronutrient intakes of children aged 8 and older (Lytle et al., 1993; Johnson et al., 1996).

Children were also asked to recall the activities they engaged in and for how long on the previous day using the modified SAPAC (Sallis et al., 1996). The SAPAC has been validated in previous studies that showed its moderate correlation with both heart rate index ($r=0.57$; $p<0.001$) and accelerometer scores ($r=0.3$; $p<0.001$) (Sallis et al.,

1996). The original SAPAC was self-administered and included a total of 25 physical activities and two sedentary activities, including watching television/video/DVD and using computer/video games. The questionnaire was administered by the investigator in order to increase the accuracy and validity of the collected data.

The height and weight of children were measured in the morning on day one at each school. Weight was measured using an electronic scale (Taylor Precision Performance, Oak Brook, Illinois, USA) with a stable weighing platform. Children were weighed lightly dressed and without shoes, and their weight was equally distributed on the scale. Weight was measured in kilograms to the nearest 100 grams. Height was measured using the Frankfort Plane technique while their head, back, and buttocks touched a vertical wall behind them (USDHHS, 2006). Height measurements were taken to the nearest 0.5 centimeter using a flexible tape measure.

Measurements and Variables

Self-reported height and weight of parents were used to calculate parental BMI as kg/m^2 (overweight: BMI of $\geq$25; obese: BMI of $\geq$30) (De Onis & Habicht, 1996). Monthly household income (in Czech Crowns) was reported by parents in five categories: $\leq$10,000, 11,000-20,000, 20,000-30,000, 30,000-40,000, and >40,000. Parents reported education level in four categories: elementary, vocational, high-school, and university education.

Demographic information collected from children included age, gender, and grade. Height and weight measurements were used to calculate children's BMI as kg/m^2.

In this study, the prevalence of overweight among children was assessed using two sets of standards, the Czech reference values and the 2000 Centers for Disease Control (CDC) growth charts (Lhotska et al., 1993; Kuczmarski et al, 2000). Growth charts developed based on the fifth National Anthropological Survey (NAS) in the Czech Republic were used to estimate the prevalence of overweight and obesity among children in the study (Kobzova et al., 2004). Based on these gender- and age-specific growth charts, children were classified into four categories: underweight (<10^{th} percentile), normal weight (10-90^{th} percentile), overweight (>90^{th} percentile), and obese (>97^{th} percentile). Growth was also evaluated using the 2000 CDC reference values by calculating percentiles of BMI-for-age for each child (CDC, 2002). Children at risk for overweight were identified by BMI-for-age of ≥85^{th} and <95^{th} percentile and overweight children were identified by BMI-for-age of >95^{th} percentile. Children with BMI-for-age below 5^{th} percentile were considered underweight (Kuczmarski et al, 2000). In addition to percentiles, z-scores for the children's BMI-for-age and weight were calculated. Z-scores represent the deviations of the value for an individual child from the mean value of the reference population divided by the standard deviation for the reference population (Kuczmarski et al, 2000).

Dietary intakes obtained from the two 24-hour recalls were analyzed using the nutrient analysis software Food Processor (Food Processor 8.4, 2005). Total energy, fat, and energy derived from fat were obtained from the two 24-hour recalls. The average amount of these variables was measured as a 2-day average of the amount of kilocalories, grams of fat, and percentage of energy from fat. Children's fruit and vegetable consumption was also estimated from the 24-hour recalls. A calculation of fruit and vegetable servings based on the Food Guide Pyramid has been shown to be a valid

measure of children's fruit and vegetable intake in previous studies (Domel et al., 1994). Thus, a two-day average consumption of fruits and vegetables was calculated for each child from the 24-hour recalls (Domel et al., 1994; Cullen et al., 1999). The MyPyramid developed by the United States Department of Agriculture in 2005 was used as a guide for calculating an average number of cups of fruits and vegetables each child consumed (USDA, 2005). In addition, consumption of dietary fiber was estimated from the 24-hour recalls.

Because there are no specific dietary recommendations for Czech children and the original Czech recommendations have not been updated since late 1980's, dietary intakes were compared to the MyPyramid recommendations in addition to using the original Czech dietary standards (Dietary Reference Intakes (DRI), 2002**;** USDA, 2005; Society for Nutrition, 1989). The children's energy, fruit, and vegetable intakes were compared to the MyPyramid recommendations based on their age, gender and physical activity level (USDHHS, 2005). The MyPyramid energy levels for children were based on the Estimated Energy Requirements (EER) from the DRI (DRI, 2002). Dietary fiber intakes were compared to the Adequate Intake for children aged 9 to 13 (DRI, 2002).

Metabolic equivalents (METs) were assigned to all of the physical activities reported by children. One metabolic equivalent is defined as the ratio of the work metabolic rate to the resting metabolic rate (Ainsworth et al., 2000). One MET is equal to the amount of oxygen per kilogram of body weight per minutes that is consumed when sitting quietly (3.5 ml/kg/min or 1 kcal/kg/hour). All of the activities in which children participated were assigned specific METs based on the updated Compendium of Physical Activities developed by Ainsworth et al. (2000). A two-day average of estimated METs

expended by each child was calculated. The average number of minutes each child spent in moderate and vigorous activities was also calculated using METs. Moderate activity was defined as any physical activity during which children expended 3-6 METs and vigorous activity was defined as any activity with METs of greater than 6 (Ainsworth et al., 2000). The amount of time (in minutes) children were moderately or vigorously active was added and a two-day average was calculated for each child.

Dietary intakes of energy, fat, percent energy from fat, fruits and vegetables, and fiber were compared to the Czech and U.S. recommendations using one sample t-tests. Differences between boys and girls were identified using independent t-tests. Children's weight and BMI-for-age were converted into percentiles and z-scores based on the 2000 CDC reference values (Kuczmarski et al., 2000). The z-score computation was conducted using the EpiNut statistical package (Epi Info, 2005). Bivariate correlations between dietary, exercise and demographic variables, and children's z-scores for weight were examined. A linear regression model was used to identify significant predictors of children's z-scores for BMI-for-age and weight. Parental BMI, education, income, children's age, energy intake, percent energy from fat, time (minutes) spent in moderate and vigorous activity, and fruit and vegetable intake were included in the model as independent variables. The Statistical Package for Social Sciences (SPSS 12.0, version for Windows, 2003) was used to conduct statistical analysis in this study. The level of significance was set at 0.05.

Results

Ninety seven parents and their children participated in the study. The descriptive characteristics of the subjects are summarized in Table 4.1. The sample of children included 42 boys and 55 girls. Almost all of the parents who participated in the study were females. The majority of parents had at least a high school degree. The mean parental BMI of 22.8±3.9 fell within a healthy range which is defined by internationally recognized standards as BMI of 18.5 to 24.99 (WHO, 1995). Less than one fourth of parents were overweight (BMI ≥25) or obese (BMI ≥ 30).

The prevalence of overweight and obesity among children using the Czech reference cutoffs of 90th and 97th percentile (Lhotska et al., 1993) and the 2000 CDC reference cutoffs of 85th (at risk for overweight) and 95th (overweight) percentile (CDC, 2002; Kuczmarski et al., 2000) is presented in Table 4.2. The sample included 7.2% overweight children based on the Czech reference values and 10.3% children who were at risk for overweight based on the 2000 CDC reference values (Table 4.2). Four children in the sample were identified as obese using the Czech standards and overweight using the CDC standards (Table 4.2). The overall prevalence of overweight and obesity in the sample was 11.3% based on the Czech standards and 14.4% based on the 2000 CDC reference values.

Based on the 2000 CDC cutoffs, the prevalence of overweight was higher among boys compared to girls, however, there were no gender differences in the prevalence of overweight based on the Czech reference values (Table 4.3). While the sample size did not allow for a statistical analysis based on age groups, children aged 10 appeared to have

the highest mean z-score for BMI-for-age in the sample (Figure 4.1). In contrast, the BMI-for-age z-scores tended to decrease with older age. Thus, 13-year old children in the sample appeared to have the lowest BMI-for-age z-scores (Figure 4.1).

Analysis of the 24-hour recalls revealed several trends in children's diets (Table 4.4). The mean energy intake of children was 1,416±374 kcal/day with no significant difference between boys and girls (Table 4.4). Overall, children consumed 28.5% of their total daily energy from fat. Boys consumed a significantly higher proportion of energy derived from fat and girls consumed significantly more energy from carbohydrates (Table 4.4; $p<0.01$). The daily fiber intake was similar in both genders with the mean fiber intake of 11.9±6.6 grams. Children consumed approximately 1.4±1.1 cups of fruit and 1.2±0.9 cups of vegetables daily (Table 4.4). There were no significant differences in fruit and vegetable consumption by gender. However, girls tended to consume slightly more fruits than boys (Table 4.4; $p=0.064$).

Analysis of the physical activity questionnaire (SAPAC) allowed for evaluation of the amount and intensity of physical activities in which children participated on two days. The summary of findings for the entire sample as well as gender differences are presented in Table 4.5. On average, children expended about 495±259 metabolic equivalents (METs) on two days, with boys tending to be slightly more active than girls (548 vs. 455 METs; $p=0.083$). Children spent approximately one hour watching television and reported using a computer for 8 minutes a day (Table 4.5). Most children were engaged in at least one moderate or vigorous activity on the two days. Boys engaged in vigorous activities for a significantly longer period of time than girls (Table 4.5; $p<0.01$). The

results showed that children participated in more minutes of moderate activities than vigorous activities (Table 4.5).

Prior to conducting a linear regression analysis, bivariate correlations revealed a significant negative relation between children's age and z-scores for weight ($r=-0.29$; $p<0.01$). Children's energy intakes and their z-scores for weight tended to be negatively related ($r=-0.18$; $p=0.08$). A linear regression model with z-scores for weight as the dependent variable revealed that children's younger age was the only significant predictor of higher z-scores for weight ($R^2=0.144$; $p<0.05$). This finding was confirmed by a linear regression model with z-scores for BMI-for-age as the dependent variable. None of the parental, dietary or physical activity variables were found to be significant predictors of children's weight.

Table 4.1. Demographic and anthropometric characteristics of parents and children

Category		n	%	Mean + SD
Children				
	Age (years)	97	100.0	11.0±1.03
	BMI (kg/m^2)	95	95.0	18.4±2.52
	Grade			
		4th grade	27	28.0	-
		5th grade	43	44.0	-
		6th grade	27	28.0	-
	Gender			
		Males	42	43.0	-
		Females	55	57.0	-
Parents				
	Age (years)	92	95.0	37.3±5.25
	Gender			
		Males	4	4.0	-
		Females	94	96.0	-
	BMI (kg/m^2)	92	95.0	22.8±3.48
		<18.5	5	5.2	-
		18.5-24.99	66	68.0	-
		25-29.99	18	18.6	-
		>30	3	3.1	-
	Education			
		elementary	0	0.0	-
		vocational	20	20.6	-
		high-school	55	56.7	-
		university	18	18.6	-
	Monthly Income			
		<10,000	2	2.1	-
		11,000-20,000	36	37.1	-
		20,000-30,000	28	28.9	-
		30,000-40,000	15	15.5	-
		>40,000	6	6.2	-

Table 4.2. Child obesity prevalence as defined by the 2000 CDC and the Czech reference values

Reference Values	Obesity Prevalence	
	n	*%*
2000 CDC Reference Values[1]		
At risk for overweight (≥85th-<95th percentile)	10	10.3
Overweight (≥95th percentile)	4	4.1
At risk for overweight (≥85th percentile)	14	14.4
Czech reference values[2]		
Overweight (90th-97th percentile)	7	7.2
Obese (>97th percentile)	4	4.1
Overweight or obese (>90th percentile)	11	11.3

[1] CDC, 2002
[2] Lhotska et al., 1993

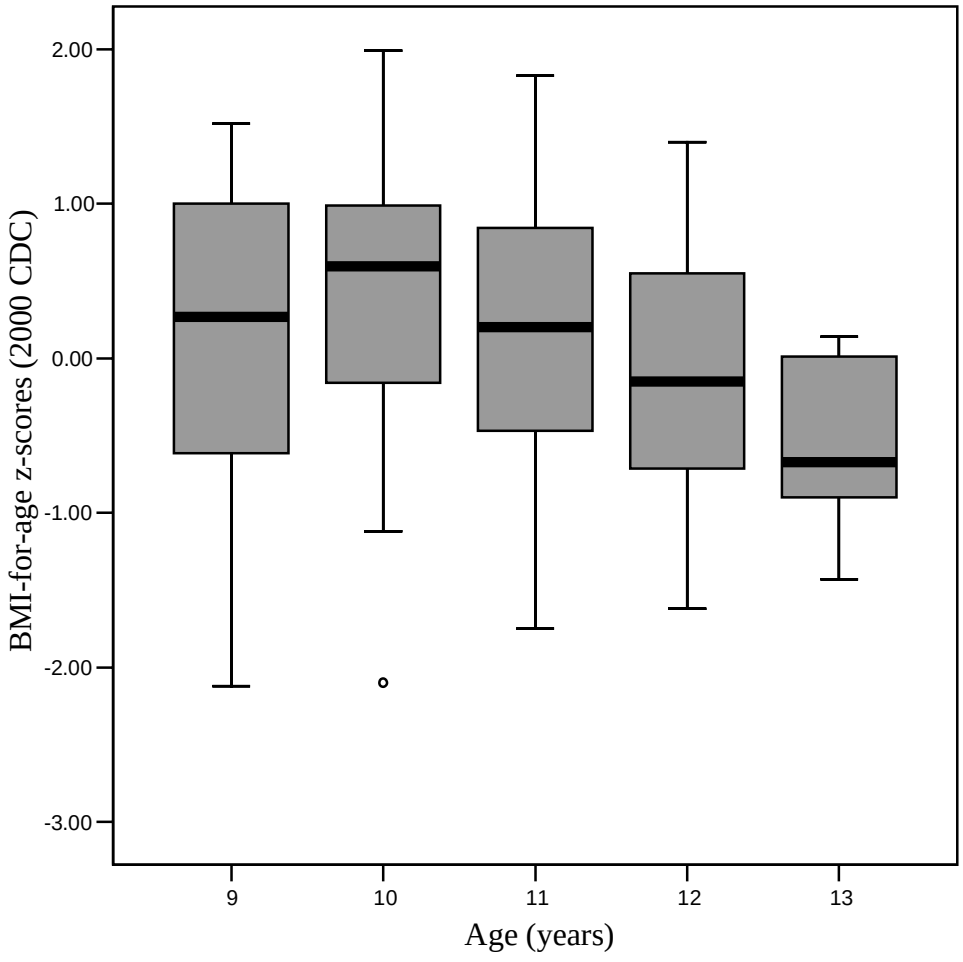

Figure 4.1. Box plots of children's z-scores for BMI-for-age

Table 4.3. Ratio of children in overweight and obese categories by gender and reference values

Weight Status	Males	Females
2000 CDC Reference Values[1]	%	%
At risk for overweight (85-95th percentile)	11.9	9.1
Overweight (>95th percentile)	4.8	3.6
Czech reference values[2]		
Overweight (>90th percentile)	7.1	7.3
Obese (>97th percentile)	4.8	3.6

Table 4.4. Differences in dietary intakes of children by gender

	Total (n=97)	Males (n=42)	Females (n=55)	P-value
Energy (kcal)	1416±374	1460±403	1383±350	0.321
Fat (g)	45.5±15.3	48.8±14.4	43.0±15.6	0.064
Fat (% energy)	28.5±5.8	30.3±5.9	27.2±5.4	0.009**
Carbohydrates (% energy)	57.4±7.2	54.9±6.9	59.2±6.9	0.003**
Protein (% energy)	14.1±3.48	14.8±3.8	13.6±3.1	0.090
Fiber (g)	11.9±6.6	10.9±3.8	12.7±8.0	0.164
Fruit (cups)	1.4±1.1	1.1±1.1	1.6±1.2	0.064
Vegetables (cups)	1.2±.9	1.1±.7	1.3±.9	0.294

** $p<0.01$

Table 4.5. Differences in minutes of physical activity and sedentary behaviors of children by gender

Activity	Total (n=95)	Males (n=41)	Females (n=54)	P-value
Moderate	84.8±104.9	67.7±47.7	97.8±132.0	0.167
Vigorous	23.9±36.5	36.4±38.3	14.5±14.7	0.003**
Moderate & Vigorous	96.7±50.7	104.1±48.9	91.0±51.6	0.213
TV/DVD	57.5±43.6	62.6±42.6	53.7±44.5	0.327
Computer	8.3±19.5	14.1±26.3	3.8±10.4	0.009**

** $p<0.01$

Discussion

Child obesity rates recently increased among elementary school children in the Czech Republic (Kobzova et al., 2004). Even though the prevalence of overweight among Czech children remains lower than the rates of overweight in the U.S. and other countries, several studies suggest that in the last two decades young Czech children have been getting heavier (Kobzova et al., 2004; Kovarova et al., 2002). Because of the negative trend in child obesity, it is essential to evaluate children's dietary intakes and physical activity and identify major factors that influence children's body weight so effective interventions can be developed for Czech children. Several studies have examined similar influences among American children and pediatric populations in other countries (Cullen et al., 2000; Savva et al., 2002; Lamerz et al., 2005), but there is a lack of knowledge about recent nutrient intakes, dietary trends and exercise behaviors among Czech children.

Our study examined current dietary habits and physical activity behaviors in a sample of Czech fourth, fifth, and sixth graders. Analysis of the 24-hour recalls revealed that most children aged 9 to 13 reported consuming less energy than is recommended based on both the Czech and the MyPyramid dietary recommendations (Society for Nutrition, 1989; USDA, 2005). While the use of a multiple-pass 24-hour recall may have contributed to underreporting of energy and nutrient intakes among children, this finding was consistent with a study by Soltysova & Bellisle (1994) in which 10-year old children consumed 10% less energy than recommended by the Czech dietary standards (Society for Nutrition, 1989). Low intakes of energy have been also observed among children from other transitional countries, such as Hungary (Zajkas, 1998).

The total amount of energy derived from fat was 28.5% which was within the suggested range of 25-35% of energy from fat for children aged 4 to 18 (USDA, 2005). Children in our sample consumed less energy from fat than Czech children in one previous study (35% of energy from fat) conducted in the 1990's (Soltysova & Bellisle; 1994). The children's relatively low dietary intake of fat in our sample may be attributed to the economic and political changes occurring in the Czech Republic since the late 1980's (Parizkova, 2000; Andel, 1997). The shift from a centrally planned economy to a free market economy has caused a 300% increase in the price of beef and even larger increases in the price of milk (Andel, 1997). Thus, consumption of meat and dairy products has declined significantly compared to the past and this decrease may also be responsible for children consuming less fat (Parizkova, 2000; Andel, 1997).

Czech children in our study consumed less than half the recommended amounts of fruits and vegetables. On average, children in our sample consumed 1.4 and 1.2 cups of fruit and vegetables, which is lower than the MyPyramid recommendation for 9-year old sedentary girls (USDA, 2005). Recommendations for fruit and vegetable intakes are 2-4 and 3-5 servings for Czech adults, although no specific recommendations have been established for children in the Czech Republic (WHO, 2003). Our finding was consistent with the results of several studies that examined dietary intakes among children in other Eastern European countries (Martinchuk et al, 1997; De Lorenzo et al., 1996). For instance, a study on dietary habits of 10 to 15 year old Moscow children revealed that they did not consume fruit, fruit juice or vegetables on a regular basis (Martinchuk et al., 1997).

The children's low consumption of fruit and vegetables was also reflected in their poor intakes of dietary fiber. Compared to the Czech recommendations of 17 grams of fiber for 7 to 10 year olds, 18 grams for 11 to 14 year old girls, and 20 grams for 11 to 14 year old boys, the consumption of 11.9 grams of dietary fiber was not sufficient (Society for Nutrition, 1989). The Czech dietary recommendations for fiber are substantially lower than the U.S. recommendations (DRI, 2002). Girls and boys aged 9 to 13 would be expected to consume 26 grams and 31 grams of fiber based on the DRIs (DRI, 2002). Low consumption of fruits and vegetables as well as rare consumption of whole wheat breads and cereals is likely responsible for such low fiber intakes. A qualitative analysis of the 24-hour recalls indicated that only a few children in the sample consumed some type of whole grain breads or cereal. Inadequate fiber consumption was reported among children in the U.S. and Western Europe as well as in Eastern European countries (Parizkova, 2000; Szponar & Rychlik, 1996). One of the limitations of our study was related to the evaluation of children's dietary intakes. While a multiple-pass 24-hour recall has been shown to be a valid method for evaluating children's dietary intakes (USDA, 1998; Moshfegh et al., 1999), it is important to note that the analysis of children's diet was limited by the use of only two 24-hour recalls. This limitation was caused by the efforts of the investigators to minimize interference with children's instruction during the study.

Previous research showed that sedentary behaviors significantly contribute to the development of obesity among children (Eisenmann et al., 2002; Troiano et al., 2000; Robertson et al., 1999; Andersen et al., 1998). Furthermore, more than 4 hours of television watching per day has been associated with an increased risk for overweight

among young children in the U.S. (Eisenmann et al., 2002; Dietz & Gortmaker, 1985). The increased risk for overweight may be caused not only by substituting physical activity with television but also by increasing children's exposure to advertisements of high-energy foods (Storey et al., 2003; British Medical Association (BMA), 2005). In our study, children watched television for about one hour and engaged in approximately 90 minutes of either moderate or vigorous physical activity a day. While no specific recommendation for physical activity for children exists in the Czech Republic, most children met and some children exceeded the recommendation of at least 60 minutes of physical activity that is recommended for American children by the Dietary Guidelines for Americans (USDHHS, 2005)

Even though children in our sample participated in the recommended amount of physical activity, the findings of our study confirmed a trend of increasing obesity rates among Czech children that was suggested in a 2001 study by Kobzova et al. (2004). The prevalence of both overweight and obese children combined was estimated between 11.3% and 14.4%, depending on which reference values were used for the analysis. Thus, the rates found in our study were higher than the overweight and obesity rate of 10% that was reported in the 1991 National Anthropological Survey (NAS) (Lhotska et al., 1993). Based on the Czech cut off values, the rate of obesity was higher in both boys and girls (4.8% and 3.6%) compared to the obesity rates of 3% in 1991 (Lhotska et al., 1993). In contrast, our results were similar to the rates of overweight and obese children estimated from the 2001 NAS (Lhotska et al., 1993). Boys in our study were found to be at higher risk for obesity than girls which is consistent with previous studies (Kobzova et al., 2004). Even though our sample of children was not nationally representative, our

study confirmed the results of a study by Kobzova et al. (2004) suggesting that there is a trend towards increased obesity rates among Czech elementary school-aged children.

As child obesity rates continue to rise in the Czech Republic, it is important to carefully examine current dietary behaviors and exercise habits of children. Even though our sample was not nationally representative, our findings identified important trends in the dietary intakes and physical activity of Czech school-aged children. The role of fruits and vegetables in children's diets and their benefits in terms of obesity prevention has been emphasized in previous research (Rolls et al., 2004; Dennison et al, 1998). Regular intake of fruits and vegetables significantly influence satiety and energy intake which in turn may directly affect body weight of children (Rolls et al., 2004). In addition, a study by Dennison et al. (1998) indicated that adequate consumption of fruits and vegetables may decrease the risk of several chronic diseases, including cardiovascular disease and diabetes. As stated in the WHO report on Food and Nutrition Policy in the European Region (WHO, 2001), diets low in plant foods and high in fat are largely responsible for the obesity epidemic among children and adults in Europe. Despite obvious benefits of fruit and vegetable consumption, children in the Czech Republic and many European countries do not consume enough fruits and vegetables on a regular basis (Matrinchuk et al., 1997; De Lorenzo et al., 1996; Parizkova, 2000).

While a future study on dietary habits and physical activity with a nationally representative sample of Czech children is warranted, our study contributes to the existing literature on Czech children's dietary intakes and physical activity. Based on the findings of our study, nutritional professionals in the Czech Republic should focus on

improving the dietary habits among school-aged children and address the inadequate consumption of fruit, vegetables, and fiber in future nutrition interventions.

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CHAPTER V

A COMPARISON OF AMERICAN AND CZECH SCHOOL-AGED CHILDREN: RELATION BETWEEN BODY MASS INDEX AND DIETARY INTAKES, PHYSICAL ACTIVITY, AND ENVIRONMENTAL INFLUENCES

Abstract

Objective: To compare dietary intakes, physical activity, and environmental factors that influence children's BMI-for-age between American and Czech children.

Design: Cross-cultural correlational study. Administration of the Parent Questionnaire and school visits were used to collect data.

Setting: Eight public schools in one American and two Czech cities.

Participants: 97 Czech and 45 American 4-6th graders and their parents from urban public schools (response rate of 32% in Czech and 17% in the U.S).

Variables Measured: Energy, fat, dietary fiber, cups of fruits and vegetables, and fast food visits were evaluated using 24-hour recalls. Physical activity was measured using the Self-administered Physical Activity Checklist. Questionnaire evaluated parenting style, food socialization, food preparation, and grocery shopping practices of parents.

Analysis: Chi-square and independent t-tests compared diets and physical activity between American and Czech children. Factor analysis was used to analyze the five parental scales. A multiple regression model determined predictors of children's BMI-for-age z-scores.

Results: American children consumed more energy and fat ($p<0.001$), less fruits and vegetables ($p<0.01$), and were less active ($p<0.001$) than Czech children. Availability of healthy foods was lower ($p<0.001$) in American households. American parents used authoritative parenting style ($p<0.001$) and explained positive consequences of food consumption more often than Czech parents ($p<0.001$).

Conclusions and Implications: Czech children have a healthier diet and are more physically active than American children. Involvement of parents in food preparations and a greater availability of healthy foods may be responsible for the higher dietary quality among Czech children.

Key Words: Child overweight, dietary habits, physical activity, environmental factors, parenting style, Czech Republic

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Introduction

Child obesity has reached epidemic proportions among American children in the last two decades (World Health Organization (WHO), 2002; Ogden et al., 2002; Cole et al., 2000). It is estimated that up to 22% of American school-aged children are

overweight and one in every three children is at risk for overweight (Ogden et al., 2002). Research shows that being overweight or at risk for overweight puts children at increased risk for chronic diseases, including cardiovascular disease, hypertension, hypercholesterolemia, and type 2 diabetes (United States Department of Health and Human Services (USDHHS), 1998; Fagot-Campagna et al., 2000; WHO, 2000). Overweight children are likely to remain overweight or obese as adults (Whitaker et al., 1997; Webber et al., 1995; Kelder et al., 1994). In addition to a variety of medical problems, excess adiposity also results in social, economic, and psychological consequences that negatively influence the health and overall well-being of children and adolescents (Flegal et al., 1998; USDHHS, 1998).

Experts agree that obesity results from an imbalance between energy intake and energy expenditure (DeLany, 1998; Dietary Reference Intakes (DRI), 2002). However, the causes of child obesity are very complex and a wide range of factors influence children's body weight and adiposity (DeLany, 1998; DRI, 2002). Dietary and behavioral factors include excessive intakes of energy and fat, frequent fast food consumption, larger portion sizes, a preference for high-fat foods, decreased fruit and vegetable intake, lack of physical activity, and greater television watching (Neumark-Sztainer et al., 2003; Gray & Smith, 2003; Paeratakul et al., 2003; Troiano et al., 2000; Robertson et al., 1999). Children who consume high-fat diets tend to exceed their daily energy requirements, which leads to a gradual weight gain (Stubbs et al., 1995; Kendall et al, 1991). This trend is apparent especially among children who consume fast foods on a regular basis (Paeratakul et al., 2003; French et al., 2001; French et al., 2000).

A decrease in children's energy expenditure over the last three decades has also contributed to a positive energy balance (Golan & Crow, 2004; USDHHS, 1996; DRI, 2002; Kimm et al., 2002). It is estimated that 14% of American children aged 12 to 21 are not physically active at all and less than half engage in regular vigorous exercise (Centers for Disease Control (CDC), 2004). While an increased risk of obesity among children and adolescents has been associated with television watching (Eisenmann et al., 2002; Nestle & Jacobson, 2000; Dietz & Gortmaker, 1985), research shows that American children continue to spend less time being physically active and more time in sedentary behaviors (Nestle & Jacobson, 2000; Annenberg Public Policy, 1997).

Given the negative consequences of obesity on the quality of life, it is essential to understand various factors that influence children's dietary intakes and physical activity. Previous research showed that personal characteristics such as taste, food preference and knowledge do not explain food-related behaviors of children and are poor predictors of BMI (Caballero et al., 2003; Domel et al., 1996; Resnicow et al., 1997). According to Social Cognitive Theory, human behavior results from constant, triadic and dynamic interactions between a specific behavior, personal characteristics and the environment (Bandura, 1978). Based on the principles of SCT, environmental factors play an essential role in shaping and influencing health behaviors among children (Bandura, 1978). Two types of environmental factors have a potent influence on children's food choices and physical activity. Social influences are extremely important because the majority of dietary behaviors develop within a family context early in children's life (Davison & Birch, 2001; Cullen at al., 2000; Glanz et al., 1997). In addition, physical

environmental factors, such as food availability, may have a strong influence on children's food choices (Cullen et al. 2000; Hearn et al., 1998).

Parents are key players in creating an environment in which children learn and adopt healthy dietary behaviors and preferences for nutrient-dense foods (Davison & Birch, 2001; Cullen at al., 2000; Hearn et al., 1998). Health-related behaviors, attitudes, and values of parents have a direct impact on their child's health behavior (Olvera-Ezzel et al., 1990; Cousins et al. 1993; Birch, 1998; Birch & Fisher, 1998). Among the common parenting styles (authoritarian, permissive, and authoritative (Baumrind, 1967, 1971), authoritative parenting style was shown to be most successful in terms of encouraging healthy dietary and exercise behaviors among children (Querido et al., 2002; Schmitz et al., 2002; Nicklas et al., 2001; Anliker et al., 1990; Brannen & Fletcher, 1999). On the other hand, authoritarian and permissive parenting styles have been negatively associated with children's self-control (Patock-Peckham et al., 2001; Birch & Fisher, 1995; Baumrind, 1967). In fact, coercive feeding practices used by authoritarian parents to promote the consumption of a particular food often lead to opposite outcomes because they heighten children's desire or dislike for a particular food (Birch & Fisher, 1995). Parents also use a variety of food socialization practices to either encourage or discourage the consumption of a particular food (Cullen et al., 2000). Age-appropriate explanations, reasoning, and modeling to encourage consumption of certain foods rather than force and punishment (Brannen & Fletcher, 1999) have been associated with better dietary outcomes among children (Cousins et al., 1993; Olvera-Ezzell et al., 1990).

Along with social environmental factors, physical environmental influences may be critical for the development of healthy dietary behaviors among children (Cullen et al.

2000; Glanz et al., 1997). Food availability at home reflects food choices of the family members and encourages or discourages the consumption of various foods by children (Hearn et al., 1998). Hearn et al. (1998) found that children were likely to consume more fruits, juice and vegetables if these foods were available and accessible at home and at school. In addition, parents may positively influence children's food consumption through family meals and menu planning (Golan & Crow., 2004; Cullen et al., 2000). Studies show that the dietary quality of children was significantly higher among children who had more frequent family meals at home compared to children who ate most of their meals without their family (Neumark-Sztainer et al., 2003; Gillman, 2000).

While child obesity rates continue to increase in the U.S., children in the Czech Republic (formerly Czechoslovakia), are significantly leaner than American children (Lissau et al., 2004). Based on the National Anthropological Surveys (NAS), only 3.7% and 4.7% of Czech girls and boys aged 6-18 were obese in 2001 (Kobzova et al., 2004) and the obesity prevalence among young adolescents is among the lowest in European Union (Lissau et al., 2004). Because the traditional Czech diet is based on high-fat meat products with very little fruits, vegetables and whole grains (WHO, 2001a; Benesova & Havelkova, 1999; Filiberti et al., 1995), the low prevalence of overweight among Czech children is surprising. Although a study by Soltysova and Bellisle (1994) indicated that the diets of 10-year old Czech children were poor, more research on dietary intakes among Czech children is warranted because the study sample was limited to children from a small North Bohemian town. The lifestyle and dietary habits of Czech children have also been influenced by recent political, economic and social changes (Parizkova, 2000). After forty years of communism, the Czech Republic underwent a rapid shift to a

free market economy in 1989 that led to many dietary and lifestyle changes within the Czech population (Parizkova, 2000). For example, the influx of foreign capital into the country resulted in a dramatic increase in fast food establishments (Ritzer, 2000; Humenikova, 2003).

While the economic transformation of the Czech Republic has been positive in some ways (i.e., increased variety of fruit and vegetables, low-fat dairy products, breakfast cereal and other nutrient-dense foods) (Andel, 1997), Czech children are increasingly exposed to a variety of processed foods that are high in energy, fat and added sugars (Humenikova, 2003). Children have also become a target of marketing campaigns launched by multinational companies such as Coke, Pepsi and McDonald's, that may further impair the development of healthy dietary habits among children (Ritzer, 2000). Children in post-communist countries, including the Czech Republic, are increasingly exposed to a number of negative lifestyle trends such as less time spent in physical activity and more television watching that may further increase their risk for obesity (Seidell, 1995; Humenikova, 2003).

Given the constructs of SCT, the dietary intakes and BMI of Czech children may be influenced by a variety of social and physical environmental factors. To our knowledge, none of the existing studies investigated the influence of environmental factors on children's dietary intakes and BMI between the U.S. and a country with lower obesity rates among children. The objectives of this study were to determine the differences in dietary intakes, type and amount of physical activity, frequency of fast food consumption, parenting style, food socialization practices, and food preparation and grocery shopping practices between American and Czech children and parents. In

addition, significant predictors of children's Body Mass Index in both countries were identified in the study.

Methodology

A cluster sampling technique was utilized to recruit school-aged children and their parents in Oklahoma City, Oklahoma, and Pilsen and Prague in the Czech Republic. Parents and their children attending fourth, fifth, or sixth grade were recruited for the study in elementary and/or middle schools. Children suffering from a chronic disease or any other condition that may have influenced their dietary intake or physical activity were excluded before the data analysis. A pilot test with 16 children and their parents was conducted in the Czech Republic one year prior to the beginning of the cross-cultural study. The study was approved by the Institutional Review Board at Oklahoma State University and the Ethical Institute of the Charles University in Prague.

To obtain a sample of American children and parents, a list of all elementary and middle schools with 10 to 90% of children receiving free or reduced lunch in the chosen county was obtained from the Oklahoma State Department of Education website and several schools were randomly selected (Oklahoma State Department of Education, 2005). In the Czech Republic, a combination of random and convenience sampling was used to recruit the schools. A list of all elementary schools was obtained from a phonebook and several schools were randomly selected in Pilsen. One elementary school in Prague volunteered to participate in the study. Informed written consent was obtained from the principal at each school.

In the U.S., a detailed description of the study, a parental written consent, and the Parent Questionnaire (PQ) were distributed to parents through their children. In the Czech Republic, parents were informed about the study and asked to participate with their child during a parent meeting at school or materials were sent home with the child. Parents who were interested in participating were asked to return a signed written consent and the completed questionnaire to a teacher through their child within four days.

The Parent Questionnaire requested parental age, gender, height, weight, education, occupation, and household income. Self-reported height and weight were used to calculate parental BMI as wt/ht^2. Household income reported by parents in both countries was classified into "below average" and "above average" categories based on government data (U.S. Census, 2004; Ministry of Industry and Trade of the Czech Republic, 2005). Five scales measuring parenting style (16 items), encouraging food socialization practices (13 items), discouraging socialization practices (13 items), food preparation practices (10 items), and grocery shopping practices (8 items) were adopted and modified from research by Cullen et al. (2000) (see Tables 5.5-5.9). Each scale was analyzed using factor analysis and reliability coefficients. To compare environmental influences on BMI between American and Czech children, each of the five environmental scales was analyzed using factor analysis and the scores for factors were calculated. The availability of healthy foods in American and Czech households was estimated using the Shelf Inventory developed by Crockett et al. (1992). Previous research indicated that the shelf-inventory had 86% sensitivity and 92% specificity and represents a valid measure of food availability in households (Crockett et al., 1992).

All fourth, fifth and sixth graders whose parents gave permission for their participation were asked for assent to take part in the study prior to any data collection. To collect data from children, school visits on two separate days (at least two days apart) were scheduled with the principals and teachers from the participating schools. Children's height, weight, dietary intake, and physical activity were collected during two visits at schools. Children's weight was measured using an electronic scale (Taylor Precision Performance, Oak Brook, Illinois, USA) and their height was measured using a flexible tape while their head, back, and buttock were touching a vertical wall behind them. Children's Body Mass Index percentiles were calculated for each child using age and gender specific growth charts developed by the U.S. Centers for Disease Control and Prevention (CDC, 2002). The CDC growth charts were also used to classify children as normal weight (5^{th}-84^{th} percentile), at risk for overweight (85^{th}-94^{th} percentile), and overweight ($\geq 95^{th}$ percentile).

The research instruments included the multiple-pass 24-hour recall (United States Department of Agriculture (USDA), 1998; Moshfegh et al., 1999; Lytle et al., 1993) and the Self-Administered Physical Activity Checklist (SAPAC) (Sallis et al., 1996). The SAPAC represents a 24-hour recall of 25 physical activities and sedentary behaviors, such as watching television and playing video games, and was validated in previous research (Sallis et al., 1996).

Children completed a multiple-pass 24-hour recall and the modified SAPAC on two separate days with the help of the investigator or a trained research assistant. Plastic food models, real food examples, bean bags and household measuring tools (cups, tablespoons, glasses etc.) were used to stimulate children's memory and thus improve the

quality of the 24-hour recall. All foods and beverages obtained from the 24-hour recalls were analyzed using the nutrient analysis software Food Processor (Food Processor 8.4, 2005). The recipes of Czech traditional food items were entered into the database. MyPyramid was used as a guide for calculating an average number of cups of fruits and vegetables each child consumed for the two separate days (USDA, 2005). In addition to fruit and vegetable consumption, the 24-hour recalls were used to obtain children's frequency of dining in fast food establishments. Each time a child visited a fast food restaurant during the two days of data collection, it was counted as one visit, regardless of how many items children ordered and consumed at that time.

Metabolic equivalents (METs) were assigned to all of the physical activities reported by children based on the updated Compendium of Physical Activities developed by Ainsworth et al. (2000). One metabolic equivalent is defined as the ratio of the work metabolic rate to the resting metabolic rate (Ainsworth et al., 2000). An average amount of minutes that each child spent in moderate (any physical activity during which children expanded 3-6 METs), vigorous (any activity with METs of higher than 6), and moderate and vigorous activities was also calculated (Ainsworth et al., 2000).

The Statistical Package for Social Sciences (SPSS 12.0, version for Windows, 2003) was used to conduct statistical analyses in this study. The level of significance was set at 0.05 for all statistical tests performed. Parents' responses to the items measuring parenting behaviors were analyzed using factor analysis with varimax rotation. To determine whether the responses from parents on the five scales were suited for factor analysis, Kaiser-Meyer-Olkin (KMO) measures of sampling adequacy and the Bartlett's tests of sphericity were conducted (Stevens, 2002). KMO values of >0.6 within the

correlation matrix were considered adequate for obtaining a factorable solution. To determine whether the correlation matrix was significantly different ($p<0.05$) from an identity matrix, Bartlett's test of sphericity was evaluated. Items that loaded at 0.4 or higher were included in the final scales (Stevens, 2002). Loadings of 0.4 and higher that loaded on two or more factors were removed from the scales. Because the parental responses to each item ranged from 1 to 4, the mean and standard deviation were calculated for each extracted factor. Prior to calculating the means and standard deviations, negative factor loadings were reverse coded because they represented a negative relation of the variable to the factor. Cronbach's alpha was calculated for each scale in order to evaluate internal consistency of each item. Cronbach's values below 0.5 were considered poor, values between 0.5-0.75 were considered moderate, and values above 0.75 were considered desirable measures of internal consistency (Portney & Watkins, 2000).

Chi-square and independent t-tests were used to compare demographic variables, dietary intakes and physical activity between American and Czech parents and children. Relation between children's BMI-for-age z-scores and a variety of parental, dietary and physical activity variables was examined using bivariate correlations. A multiple regression model was used to assess the effect of demographic, socioeconomic, environmental, dietary, and physical activity factors that may contribute to children's BMI-for-Age in both countries. Independent variables included nationality (U.S. or Czech), parental BMI and education, children's energy and fat intakes; minutes of moderate and vigorous physical activity, parenting style (authoritative, permissive,

authoritarian), encouraging and discouraging food socialization practices, food preparation practices and grocery shopping practices.

Results

Forty five American and ninety seven Czech parents and children participated in the study. A majority of parents in the Czech Republic were mothers (94%), while 16% of the participating parents in the U.S. were fathers. Anthropometric characteristics and age of parents and children in both countries are summarized in Table 5.1. The mean parental BMI was significantly different between the countries (Table 5.1). More than one third of (39%) of American parents had a BMI above 25 compared to only 20% of Czech parents. The prevalence of obesity (BMI of 30 and above) was also higher among American parents (19.5% vs. 3%; $p<0.01$). The education level of parents significantly differed by nationality in that more than 70% of American parents had a university education while about half of Czech parents had a high-school education (57%) ($p<0.001$).

The sample of 45 American children included 15 males and 30 females with 9 children in the fourth grade, 7 children in the fifth grade, and 29 children in the sixth grade. The sample of 97 Czech children consisted of 55 girls and 42 boys with 27 children in the fourth grade, 43 children in the fifth grade, and 27 children in the sixth grade. Based on the CDC definition of excess adiposity (CDC, 2002), 8 (17.8%) American children were overweight (BMI-for-age $\geq 95^{th}$ percentile) and 3 (6.7%) were at

risk for overweight (BMI-for-age $\geq 85^{th}$ percentile). Although chi-square analysis showed no significant differences in the prevalence of at risk for overweight and overweight ($p=0.107$), the proportion of children who were overweight was higher among American children (17.8%) compared to Czech children (5.2%). In contrast, the number of children at risk for overweight was slightly greater among Czech children (15.5%) compared to American children (6.7%). BMI z-scores of Czech children had a decreasing tendency with age compared to American children (Figure 5.1 & 5.2).

Differences in energy, dietary fat, and fruit and vegetable consumption, and the frequency of eating in fast food restaurants are presented in Table 5.2. Czech children consumed less energy and dietary fat, and visited fast food restaurants less often than American children. Fruit and vegetable intake was higher among Czech children than American children.

Analysis of the SAPAC identified differences in the amount and intensity of physical activity by nationality (Table 5.3). While the amount of time spent in vigorous activities was similar between both countries, American children spent less time in moderate activities compared to Czech children. As a result, American children were overall less active compared to Czech children. The results also indicated that there was a trend of more television watching among Czech children (Table 5.3).

Factor analysis of the five parental scales identified several factors within each scale. The characteristics of the factors, internal consistency, and results of the statistical tests performed prior to the factor analysis are presented in Table 5.4. Cronbach's alpha was calculated for each scale in order to evaluate internal consistency of each item. Cronbach's values below 0.5 were considered poor, values between 0.5-0.75 were

considered moderate, and values above 0.75 were considered good measures of internal consistency (Portney & Watkins, 2000). The internal consistency of the scales ranged from poor (grocery shopping practices scale) to good (discouraging food socialization practices).

The raw factor loadings from the principal component analysis are presented in Table 5.5-5.9. Three parenting styles were identified in the analysis: authoritative, permissive, and authoritarian (Table 5.5). Parental responses to each item differed based on the type of parenting style they used with their child. Authoritative parents were more likely to indicate that they always checked to see if their child did his/her homework and they wanted to hear about their child's problems. Permissive parents indicated that they often forgot the rules they made for their child and it was hard for them to say "no" to their child. Authoritarian parents were more likely to make rules without their child's feedback and told the child what to do. American parents scored higher on the authoritative parenting style and showed a trend towards a more authoritarian parenting style compared to Czech parents (Table 5.10).

In the 13-item encouraging food socialization practices scale, two factors, consequences and taste and modeling, were identified (Table 5.6). In order to encourage children to eat a particular food, American parents were more likely to explain consequences of the food consumption to their children than Czech parents (Table 5.10).

Negative explanations and restrictions were identified as two factors in the 13-item discouraging food socialization practices scale (Table 5.7). The findings showed that American parents were more likely than Czech parents to explain why children

should not consume a particular food in order to discourage them from its consumption (Table 5.10).

The 10 items in the food preparation practices scale loaded on three factors: meal preparation, dinner, and quality of snacks (Table 5.8). While Czech parents prepared their children's breakfast, lunch, and snacks more often than American parents, they were less involved in dinner preparation for their children (Table 5.10). In addition, American parents were more likely to discouraged children from consuming particular foods by making the foods unavailable to them (i.e., getting rid of them, entertaining children with activities).

Items in the grocery shopping practices scale loaded on three factors: food labels and nutrition information, planning, and price (Table 5.9). There were no significant differences in grocery shopping practices between American and Czech parents (Table 10).

Analysis of the Shelf Inventory revealed that the availability of fruits and vegetables was significantly higher in Czech households than American households (Table 5.11). Although not significant, the number of low-fat diary products available at home tended to be slightly higher in Czech households compared to American households (Table 5.11).

Bivariate correlations between children's BMI z-scores and parental scales for the entire sample and each country are shown in Table 5.12-5.14. Overall, children's BMI z-scores were positively correlated with parental BMI ($p<0.05$). There were no significant associations between children's BMI z-scores and parental BMI, income, education, dietary variables, and physical activity found within the samples of American and Czech

children (Table 5.13). Permissive parenting style was positively associated with higher BMI z-scores among American children ($p<0.05$; Table 5.14). Frequent explanations used to discourage consumption of a particular food were associated with higher BMI z-scores among Czech children ($p<0.05$; Table 5.14). None of the other factors extracted from the parenting style, food socialization, food preparation, and grocery shopping scales were significantly correlated with children's BMI z-scores in the U.S. and the Czech Republic.

In the entire sample, analysis of individual items within each factor revealed that children whose parents prepared their breakfast and lunch more often tended to have lower BMI z-scores compared to other children (Table 5.15; $p<0.05$). In regard to the negative explanations used by parents to discourage consumption of a particular food, children who were often told that a particular food made them fat were likely to have higher BMI-for-age z-scores (Table 5.15; $p<0.001$) than other children. A regression model that included demographic and dietary variables and factors extracted from the factor analysis did not explain a significant amount of the variability in children's BMI z-scores ($R^2=0.153$; $p=0.949$).

Table 5.1. Age and selected anthropometric characteristics of children and parents by nationality

Characteristic*	Nationality: American (n=45)	Nationality: Czech (n=97)	P-value
	Mean±SE	*Mean±SE*	
Parents[1]			
Age (years)	39.3±0.9	37.3±0.5	0.013*
Weight (kg)	69.8±2.8	64.8±1.1	
Height (cm)	166.3±1.0	168.6±0.6	
BMI[2]	25.1±0.9	22.8±0.4	0.005**
Children[3]			
Age (years)	10.8±0.2	11.0±0.1	0.333
BMI[2]	18.9±0.6	18.4±0.3	0.367
BMI percentile[4]	56.9±4.5	54.1±2.9	0.587
Weight z-score[4]	0.4±0.1	0.4±0.1	0.974

*The number of parents and children is based on the number of subjects who disclosed information on each characteristic

[1]n=41 (US) and 92 (Czech)

[2]BMI=weight (kg)/height^2

[3]n=44 (US) and 95 (Czech)

[4]CDC, 2002

*p<0.05; **p<0.01

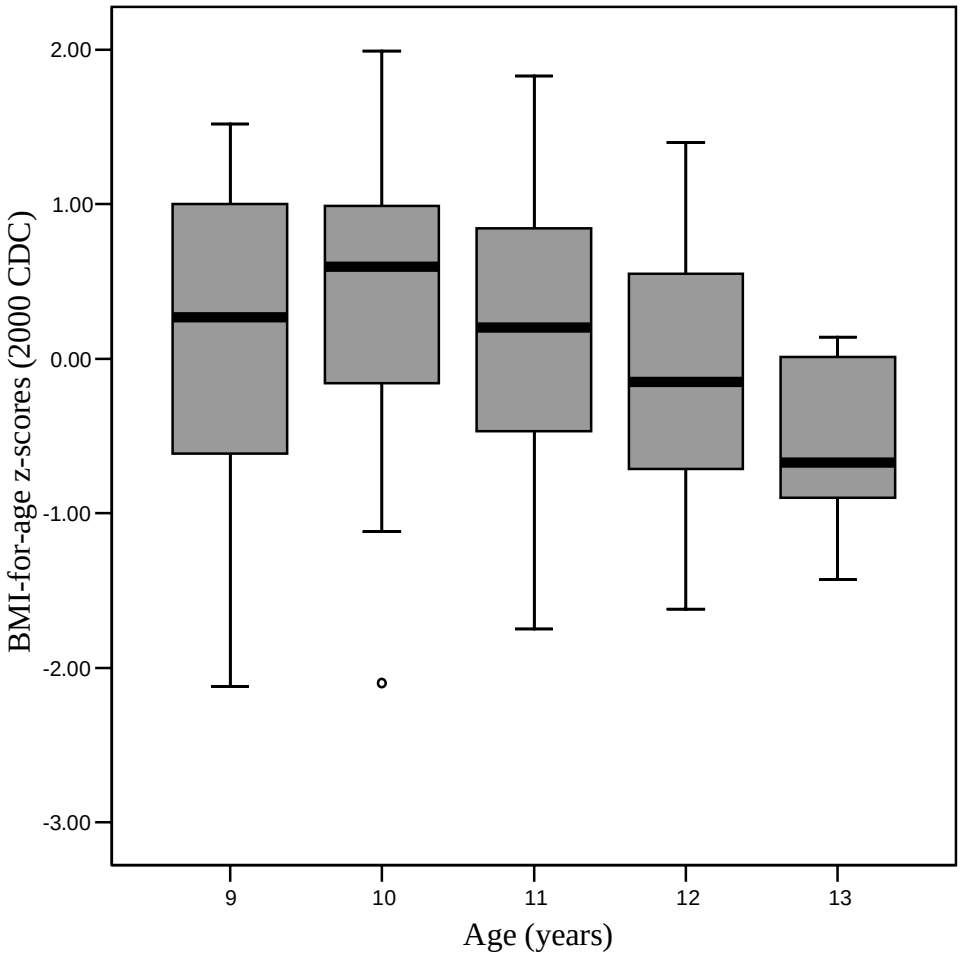

Figure 5.1. BMI-for-age z-scores of Czech children

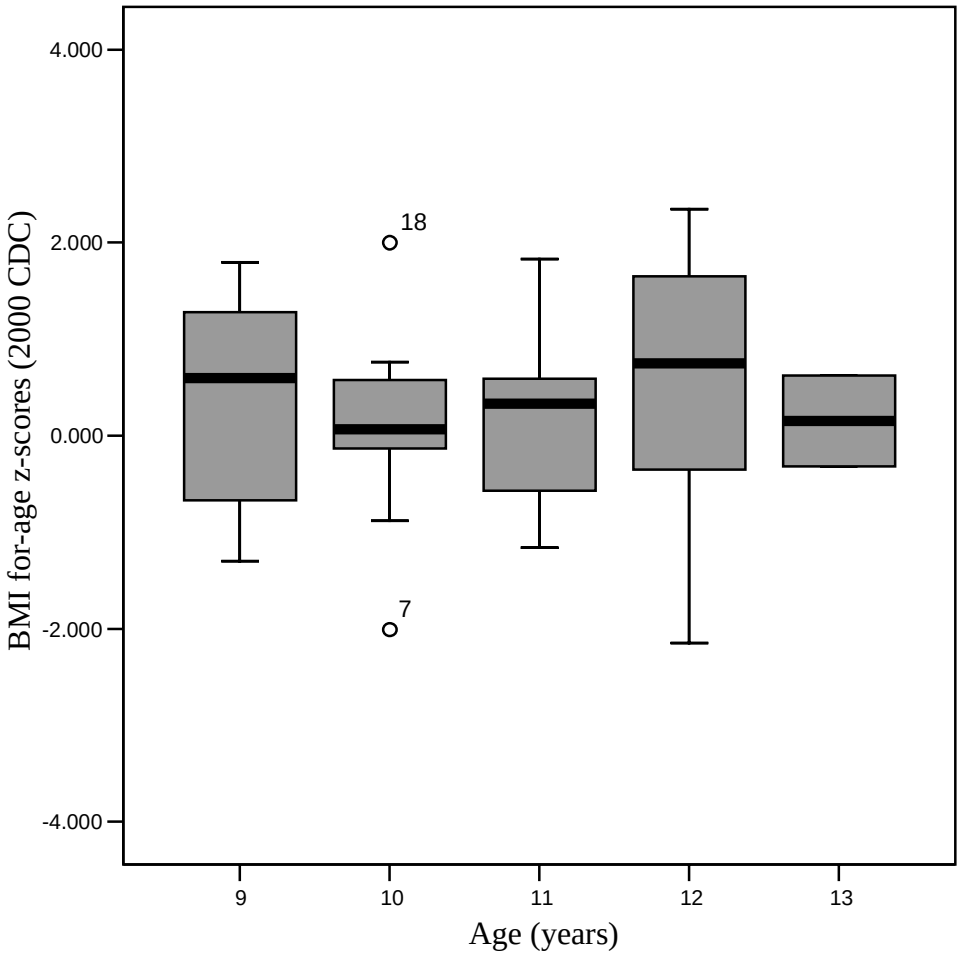

Figure 5.2. BMI-for-age z-scores of American children

Table 5.2. Differences in dietary intakes between American and Czech children

Dietary Variables	Nationality		P-value
	American	Czech	
	Mean±SE	*Mean±SE*	
Total energy (kcal)	1841±91	1403±36	<0.001***
Dietary fat (g)	68.3±4.4	45.2±1.5	<0.001***
% energy from fat	32.4±1.1	28.6±0.6	0.001**
% energy from carbohydrates	53.7±1.3	57.3±0.7	0.01**
Fruit (cups)	0.78±0.12	1.39±0.12	0.002**
Vegetables (cups)	0.75±0.09	1.18±0.08	0.003**
Fast food (no. of visits)	0.51±0.13	0.04±0.02	<0.001***

**p <0.01; ***p<0.001

Table 5.3. Differences in physical activity and sedentary behaviors between American and Czech children

Activities	Nationality		P-value
	American	Czech	
	Mean±SE	*Mean±SE*	
Total physical activity (MET)	407±48	495±26	0.086
Moderate (minutes)	48.3±7.7	84.8±10.8	0.032*
Vigorous (minutes)	19.5±5.0	23.9±3.7	0.500
Moderate & vigorous (minutes)	67.9±8.8	96.7±5.2	0.004**
Television (minutes)	41.9±6.6	57.5±4.5	0.052
Computer use (minutes)	10.2±2.4	8.3±2.0	0.567

*p <0.05; **p<0.01

Table 5.4. Characteristics of the factors extracted from the five parenting scales

Scale	Eigen-values	Cumulative Variance (%)	Cronbach's alpha	KMO	Bartlett's Test
Parenting Style	-	-	0.578	0.652	0.000
Authoritative	3.317	17.6	-	-	-
Permissive	1.957	32.7	-	-	-
Authoritarian	1.554	42.7	-	-	-
Encouraging Food Socialization	-	-	0.738	0.716	0.000
Consequences	3.391	21.1	-	-	-
Taste & Modeling	1.486	37.5	-	-	-
Discouraging Food Socialization	-	-	0.801	0.767	0.000
Negative					
	4.019	23.4	-	-	-
	1.454	42.1	-	-	-
Explanations					
Restrictions					
Food Preparation	-	-	0.659	0.619	0.000
Meal	2.631	20.9	-	-	-
Preparation	1.909	41.3	-	-	-
Dinner	1.299	58.4	-	-	-
Quality of Snacks					
Grocery Shopping			0.447	0.512	0.000
Food Labels	-	-			
&	1.876	21.5	-	-	-
	1.560	41.0	-	-	-
Nutrition Info	1.315	59.4	-	-	-
Planning					
Price					

Table 5.5. Factor loadings and mean responses to items on the parenting style scale

Factor	Description	Loading	Mean±SE[1]
Authoritative			
	Telling a child when she/he does a good job on things.	0.657	3.42±0.05
	Telling a child that the parent likes him/her just the way she/he is.	0.597	3.13±0.06
	Being interested in a child's school work.	0.621	3.76±0.04
	Checking to see if a child does his/her homework.	0.593	3.65±0.05
	Asking a child what he/she does with friends in leisure time.	0.467	3.21±0.06
	Being pleased with how a child behaves	0.599	2.96±0.05
	Wanting to hear about a child's problems.	0.430	3.72±0.04
	Making a child feel better when she/he is upset.	0.582	3.12±0.06
Permissive			
	Making sure a child tells where he/she is going.	-0.398	1.06±0.02
	Being talked into things easily.	0.789	2.33±0.06
	Forgetting the rules made for a child.	0.585	1.78±0.05
	It is hard to say "no" to a child.	0.795	1.98±0.05
Authoritarian			
	Telling a child times when she/he must come home.	0.631	3.60±0.05
	Telling a child what to do.	0.717	2.66±0.06
	Making rules without asking a child what she/he thinks.	0.636	2.01±0.06

[1]Based on the scale of 1-4 (never, sometimes, often, always)

Table 5.6. Factor loadings and mean responses to items on encouraging food socialization practices scale

Factor	Description	Loading	Mean±SE[1]
Consequences			
	Telling your child this food gives him/her energy.	0.720	2.25±0.07
	Telling a child that the food is good for his/her teeth.	0.504	2.28±0.06
	Telling a child that the food is good for him/her.	0.540	2.86±0.06
	Telling a child that he/she will be strong.	0.704	2.18±0.06
	Telling a child that you will take him/her somewhere.	0.492	1.13±0.03
	Telling a child if she/he eats it you will give him/her dessert.	0.650	1.42±0.06
	Giving a child something she/he will like.	0.419	1.73±0.07
	Taking away a privilege from a child if they do not eat it.	0.492	1.09±0.02
Taste & Modeling			
	Telling a child it tastes good.	0.832	2.53±0.06
	Telling a child to taste it because it is delicious.	0.800	2.37±0.06
	Letting a child see you eat the food.	0.466	2.76±0.07
	Making something else for a child if they do not eat it.	0.425	1.93±0.06

[1]Based on the scale of 1-4 (never, sometimes, often, always)

Table 5.7. Factor loadings and mean responses to items on food discouraging socialization practices scale

Factor	Description	Loading	Mean±SE[1]
Negative Explanations			
	Telling the child it will make him/her sick.	0.750	1.88±0.07
	Too sweet.	0.608	2.12±0.07
	Too greasy.	0.767	2.00±0.06
	Bad for his/her teeth.	0.614	2.16±0.06
	Taking away privileges.	0.435	1.13±0.04
	Tell the child it will make him/her fat.	0.601	1.62±0.07
Restrictions			
	Getting rid of it.	0.722	1.46±0.06
	Giving the child something else to do.	0.628	1.70±0.06
	Saying “do not eat it.”	0.540	1.74±0.06
	Simply not giving it to the child.	0.644	2.38±0.08

[1]Based on the scale of 1-4 (never, sometimes, often, always)

Table 5.8. Factor loadings and mean responses to items on food preparation practices scale

Factor	Description	Loading	Mean±SE[1]
Parent Meal Preparations			
	Breakfast	0.701	3.14±0.08
	Snacks	0.726	3.31±0.08
	Lunch	0.690	2.79±0.08
	Dinner	0.518	3.60±0.05
Dinner			
	Dinner as a family during the week	0.850	2.99±0.07
	Dinner as a family on the weekends	0.798	3.35±0.06
	Vegetable for dinner	0.641	2.91±0.06
Quality of Snacks			
	Fruit for snack	0.816	2.72±0.06
	Vegetable for snack	0.820	2.19±0.06

[1]Based on the scale of 1-4 (never, sometimes, often, always)

Table 5.9. Factor loadings and mean responses to items on grocery shopping practices scale

Factor	Description	Loading	Mean±SE[1]
Food Labels & Nutrition Information			
	Checking ingredients before a purchase	0.898	2.64±0.07
	Reading nutrition information on the label	0.888	2.30±0.07
Planning			
	Planning a menu before shopping	0.678	2.77±0.06
	Making a shopping list before shopping	0.785	3.09±0.07
	Child requesting products to buy	-0.580	2.44±0.06
Price			
	Comparing prices between products	0.810	2.72±0.07
	Checking food advertisement before grocery shopping	0.801	2.12±0.07

[1]Based on the scale of 1-4 (never, sometimes, often, always)

Table 5.10. Differences in parenting style, food socialization practices, food preparation practices and grocery shopping practices between American and Czech parents

Parenting Scales	Nationality of Parents		P-value
	American	Czech	
	Mean±SE	*Mean±SE*	
Parenting Style			
Authoritative	28.0±0.4	26.3±0.3	0.001**
Permissive	7.1±0.3	7.1±0.1	0.939
Authoritarian	8.6±0.2	8.1±0.1	0.053
Encouraging Food Socialization			
Consequences	16.3±0.5	14.4±0.3	0.001**
Taste & Modeling	9.9±0.3	9.5±0.2	0.256
Discouraging Food Socialization			
Negative Explanations	10.0±0.4	11.4±0.3	0.001**
Restrictions	7.9±0.3	7.2±0.2	0.069
Food Preparation			
Parent Meal Preparation	13.2±0.4	16.2±0.2	<0.001***
Family Dinners	10.3±0.2	8.8±0.2	<0.001***
Quality of Snack	4.8±0.2	4.9±0.1	0.634
Grocery Shopping			
Food Labels & Nutrition Info	5.2±0.2	4.8±0.1	0.246
Planning	8.2±0.2	8.3±0.2	0.608
Price	5.0±0.2	4.8±0.1	0.510

**p <0.01; ***p<0.001

Table 5.11. Differences in the availability of healthy foods between American and Czech Households

Food groups	Nationality of Households		P-value
	American (n=43)	Czech (n=97)	
	Mean±SE	*Mean±SE*	
Low-fat dairy[1]	2.14±0.2	2.50±0.1	<0.089
Fruit[2]	5.58±0.3	7.46±0.2	<0.001***
Fresh vegetables[3]	6.26±0.3	7.64±0.2	< 0.001***
Frozen vegetables[4]	3.81±0.4	5.34±0.2	< 0.001***

[1]five low-fat dairy products (nonfat milk, low-fat milk (1 or 2%), nonfat yogurt, low-fat yogurt, and light margarine)
[2]ten types of fruit (fresh or frozen)
[3]eleven types of fresh vegetables
[4]ten types of frozen vegetables

Table 5.12. Overall bivariate correlations between children's BMI z-scores and parental characteristics, dietary variables, and physical activity

Parenting Scales	Pearson's r	p-value
Parental BMI	0.210	0.016*
Parental Education	0.014	0.869
Household Income	0.019	0.830
Energy Intake (kcal)	0.023	0.784
Fat (grams)	0.055	0.523
Fat (% energy)	0.070	0.411
Fruits (cups)	0.038	0.658
Vegetables (cups)	-0.056	0.514
Fast food (# visits)	0.004	0.959
TV (min)	0.057	0.507
Moderate activity (min)	-0.122	0.158
Vigorous activity (min)	-0.072	0.403

* p<0.05; **p <0.01; ***p<0.001

Table 5.13. Bivariate correlations between children's BMI z-scores and parental characteristics, dietary variables, and physical activity based on nationality

	Nationality of Parents	
Parenting Scales	American	Czech
	Pearson's r	*Pearson's r*
Parental BMI	0.281	0.173
Parental Education	-0.099	0.052
Household Income	-0.170	0.115
Energy Intake (kcal)	0.186	-0.169
Fat (grams)	0.158	-0.105
Fat (% energy)	0.063	0.054
Fruits (cups)	0.213	-0.002
Vegetables (cups)	0.002	-0.062
Fast food (# visits)	-0.005	-0.050
TV (min)	0.132	0.039
Moderate activity (min)	-0.240	-0.087
Vigorous activity (min)	-0.048	-0.078

* p<0.05; **p <0.01; ***p<0.001

Table 5.14. Bivariate correlations between children's BMI z-scores and parenting style, food socialization practices, food preparation practices and grocery shopping practices of parents

	Nationality of Parents	
Parenting Scales	American	Czech
	Pearson's r	*Pearson's r*
Parenting Style		
Authoritative	-0.154	0.211
Permissive	0.377*	-0.029
Authoritarian	0.021	-0.053
Encouraging Food Socialization		
Consequences	0.011	-0.203
Taste & Modeling	-0.159	-0.025
Discouraging Food Socialization		
Negative	-0.099	0.206*
Explanations		
Restrictions	-0.070	0.016
Food Preparation		
Parent Meal	-0.192	-0.115
Preparation		
Family Dinners	0.031	-0.050
Quality of Snack	0.188	0.002
Grocery Shopping		
Food Labels &		
Nutrition	-0.208	0.202
Information		
Planning	0.035	-0.028
Prices	-0.106	0.008

*p <0.05

Table 5.15. Bivariate correlations between children's BMI z-scores and selected variables

Parenting Scales	Pearson's r
Food Preparation	
Breakfast	-0.175*
Lunch	-0.170*
Discouraging Food Socialization	
Food makes you fat	0.290**

*p <0.05; **p<0.01

Discussion

Our study contributes to the existing literature on child obesity by comparing factors that influence dietary intakes, physical activity, parenting behaviors and food availability between American and Czech children and parents. Although the mean BMI percentile of 9-13 year old children in our sample did not differ by nationality, a greater number of American children were categorized as overweight (BMI-for-age of $\geq 95^{th}$ percentile) than Czech children. In addition, BMI-for-age z-scores of Czech children had a decreasing tendency with older age. These findings are consistent with previous studies that showed a higher prevalence of overweight and at risk for overweight among young American adolescents compared to young adolescents in the Czech Republic and other European countries (Lissau et al., 2004).

The findings of our study indicated notable differences in dietary quality and exercise behaviors between American and Czech children. In addition, differences in several environmental factors that influence children's dietary intakes and risk for obesity were identified between American and Czech households. While the proportion of energy derived from dietary fat was within the recommended range of 25-35% (DRI, 2002) among children in both countries, American children consumed more dietary fat as well as total energy compared to Czech children. Because American children in our sample were more likely to visit a fast food restaurant at least once during the two surveyed days than Czech children, a consumption of fast foods may have contributed to their higher energy and fat intakes. Our findings are consistent with previous research showing that many American children eat 25% of their meals away from home, with half

of their meals consumed in fast food restaurants (Lin et al., 1998). It is well recognized that fast food establishments have become an essential part of American culture in the last several decades (French et al., 2000; National Restaurant Association, 2002; Clauson, 1999). Because fast foods often deliver large amounts of energy, fat, and added sugar into children's diet (Bowman et al., 2004; Paeratakul et al., 2003), frequent eating away from home has been associated with the current obesity rates and poor diets in American children (Popkin et al., 2001; Nicklas et al., 2001b). In contrast to American children, very few (5%) of the Czech children visited a fast food establishment during the time of the data collection. Despite the influx of Western dietary trends into the Czech Republic, the exposure of children in our sample to fast foods was minimal and may have significantly contributed to their lower energy and fat intakes.

Along with the lower amounts of energy and fat in Czech children's diet, dietary analysis indicated that Czech children consumed more fruits and vegetables than American children. Given a recent decrease in fruit and vegetable consumption in the Czech Republic, partly caused by significantly increased price of fruits and vegetables (Andel, 1997), it is surprising that Czech children consumed nearly twice as many fruits and vegetables as American children. Cullen et al. (2000) found that availability of certain foods had a direct impact on the development of eating habits and food preferences among children. In our study, the higher consumption of fruits and vegetables among Czech children may be explained by significantly greater availability of fruits and fresh and frozen vegetables in Czech households compared to American households. Although the estimation of children's dietary intakes had limitations, including a limited number of days to estimate children's energy, fat, fruit and vegetable

consumption, the analysis showed that Czech children consumed a diet with higher dietary quality compared to American children.

Lack of physical activity has been identified as one of the greatest contributors to child obesity in developed countries (WHO, 2001b; Eisenmann et al., 2002; Robinson, 1999). Previous research showed that American children spent an average of 3-4 hours a day watching television and another 3 hours a day using a computer or playing video games (Nestle & Jacobson, 2000; Annenberg Public Policy, 1997). Robinson (1999) found that television watching was associated with decreased energy expenditure and increased appetite, which may significantly increase children's risk for overweight. In our sample, both American and Czech children reported about one hour per day of television and computer use. However, our results showed that while the amount of time spent in vigorous activities was similar among children in both countries, Czech children spent more time in moderate physical activities. This finding may be partly explained by lifestyle differences of children in the Czech Republic and the U.S. Many Czech children in our sample reported walking to and from school and playing outside in the afternoon, which largely contributed to the amount of moderate activity they obtained throughout the day. In contrast, almost none of the American children in our sample reported walking to school and the amount of time spent in physical activity was largely limited to organized sports or physical education classes.

Children in both countries met the recommendation of at least 60 minutes of physical activity per day (USDHHS, 2005). However, the analysis of the SAPAC revealed that 11% of American children in our sample did not engage in any physical activity compared to only 1% of the Czech children. It is important to note that

American children spend more time at school than Czech children, which could limit their opportunities to engage in sports and other physical activities.

Child obesity is a complex issue that cannot be explained by dietary and exercise behaviors of children alone (DeLany, 1998; DRI, 2002). Within a family context, parenting style, parent-child interactions and other food-related parental behaviors are extremely important in the development of healthy dietary habits and may help prevent the development of obesity among children (Birch, 1998; Birch & Fisher, 1998; Cousins et al. 1993). Our study found interesting differences between American and Czech parents across all parenting scales except the grocery shopping practices. American parents in our sample used the authoritative parenting style more often than Czech parents. In terms of children's dietary intake and their risk for obesity, this parenting style is preferred over permissive and authoritarian style because it allows parents to implement effective discipline strategies while providing children with a loving environment in which explanations and reasoning are used to encourage, restrict or moderate children's food intake (Querido et al., 2002; Brannen & Fletcher, 1999; Baumrind, 1991; Baumrind, 1971).

The type of parenting style was also reflected in the nature of food socialization practices parents in our study used to encourage children's consumption of a particular food. To increase consumption of a particular food, American parents provided positive reasons for eating a particular food more often than Czech parents. This finding was supported by previous studies in which authoritative parents were more likely to use explanations and reasoning to encourage consumption of certain foods compared to permissive and authoritarian parents (Cousins et al., 1993; Olvera-Ezzell et al., 1990). In

contrast, Czech parents were more likely to provide negative explanations when they wanted to discourage their child from a particular food's consumption.

While we expected authoritative parents to be more successful in positively influencing their children's dietary habits, food preferences and physical activity (Querido et al., 2002; Anliker et al., 1990; Brannen & Fletcher, 1999), the results of our study did not support this argument. American children in our sample consumed more energy and dietary fat, ate less fruits and vegetables, and spent less time in physical activity compared to Czech children. Similar to previous studies (Willett, 1998; Heini & Weinsier, 1997), dietary factors such as energy and fat intakes were not significantly related to children's BMI. Further analysis of our data indicated that social and physical environmental factors, such as parental food preparation and certain food socialization practices may be important contributors to children's BMI. Based on the analysis of bivariate correlations in our sample, lower BMI z-scores among children were associated with more frequent parental preparation of breakfast and lunch. This finding was consistent with a study by Golan and Crow (2004) where the dietary quality of 9-14 year old children was significantly higher among children who had frequent family meals at home compared to children who ate most of their meals without their family. A close examination of food preparation practices of parents in both countries revealed that Czech parents were more involved in children's meal preparation.

Olvera-Ezzel et al. (1990) found that positive rather than negative food socialization practices were shown to be most effective in the development of healthy food preferences among children. Studies showed that children whose parents explain the benefits of a particular food within a positive social context are more likely to

develop healthy eating habits and thus reduce their risk for overweight than children who are forced or threatened by their parents in relation to food consumption (Cousins et al., 1993; Olvera-Ezzell et al., 1990).

Implications for Research and Practice

Our study offers a unique cross-cultural examination of factors that influence BMI of school-aged children in the U.S. and the Czech Republic, a country with relatively low child obesity rates. Czech 4-6th graders in our sample consumed diets of higher nutritional quality and were more physically active than American 4-6th graders. Although no differences in BMI-for-age were found between American and Czech children in our sample, the higher energy and fat intakes, lower fruit and vegetable consumption, and lower physical activity among American children may lead to their increased risk for obesity during adolescence. Our study offers important insights on several social and physical environmental factors that may be contributing to Czech children having a significantly lower risk for obesity during adolescence than American children (Lissau et al., 2004).

The findings of our study may be applied in the design of future intervention studies aimed at the development of healthy eating habits and prevention of obesity among American school-aged children. Because our study suggests that regular involvement of parents in food preparation and the utilization of positive food socialization practices are associated with lower BMI-for-age among children, future interventions with children and parents should focus on such behaviors. For example,

future interventions should focus on increasing parental knowledge and skills related to the preparation of healthy meals and snacks, and on teaching parents how to make such foods available and accessible to their children. Our study also suggests that nutritional professionals working with children should pay close attention to the type of food socialization practices parents use to encourage and discourage consumption of individual foods. Based on the results of our study, certain food socialization practices, such as positive explanations and reasons, should be utilized by parents in order to encourage the development of healthy eating habits within a family environment.

Lastly, our study has implications for further investigation and comparison of factors that contribute to children's BMI-for-age both in the U.S. and the Czech Republic. Because our cross-cultural sample of children and parents was limited by size and location, future studies identifying factors that influence children's BMI-for-age in both countries should be conducted with a large sample of American and Czech school-aged children. A large sample size will allow for determining significant predictors of BMI-for-age among children in both countries, which was not possible with our limited sample size. In addition, researchers interested in the role of parents on children's dietary intakes and obesity risk should explore the type and nature of food socialization practices that are associated with positive dietary outcomes and lower BMI-for-age in pediatric populations of diverse demographic and socio-economic background in the U.S.

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CHAPTER VI

BODY IMAGE PERCEPTIONS: CROSS-CULTURAL COMPARISON BETWEEN CZECH AND AMERICAN CHILDREN AND PARENTS

Abstract

Objective: To evaluate body image perceptions and body size satisfaction among Czech school-aged children and their parents and compare them to the perceptions of American children and parents.

Design: Descriptive correlational study. Data from children and parents were collected using a previously developed silhouette body image instrument.

Setting: Eight public schools in one American and two Czech cities.

Participants: 97 Czech and 45 American 4-6th graders and their parents from urban public schools (response rate of 32% in Czech and 17% in the U.S).

Variables Measured: In addition to demographic and anthropometric variables, perceived and ideal body images of children and parents were measured as interval variables ranging from 1 to 7.

Analysis: Independent t-tests compared body image perceptions between American and Czech children and parents. Paired t-tests were used to compare differences between

children's and parents' perceived and ideal body size. Significant associations between body image perceptions and other variables were identified using bivariate correlations.

Results: American children have a thinner ideal body image compared to Czech children ($p<0.05$). The ideal body image of American and Czech parents is similar ($p=0.858$). In the U.S., higher parental education is significantly associated with a thinner ideal body image among children ($p<0.05$).

Conclusions: While the pressure on children to look thinner exists within both American and Czech societies, a greater dissatisfaction with body size exists among American children. Future studies should determine what factors are responsible for American children developing a smaller ideal body image compared to Czech children.

Key Words: Body image perceptions, children, body size satisfaction, ideal body image, parents

Introduction

Positive body image and body satisfaction are important for the physical and psychological well-being of individuals and should be expected in healthy children and adolescents. Unhealthy dietary habits, weight concerns, unrealistic body image, low self-esteem, and development of eating disorders are common consequences of dissatisfaction with body size and distorted body image (Stice et al., 2000; Kelly et al., 1999; American Psychiatric Association, 1994; Coughlin et al., 2003; Patton et al., 1990). Unfortunately, an emphasis on thinness and dieting has become a social norm in many Western societies (Tiggeman, 1992; Cohn & Adler, 1992; Garner & Wooley, 1991). Given the societal

pressure to be thin, it is not surprising that many children develop body size dissatisfaction and attempt to control their weight through dietary restrictions (Hill et al., 1994). American children, as well as children from several Western European countries, have been found to have a high prevalence of body size dissatisfaction and dietary restraint (Tiggeman & Wilson-Barret, 1998; Braet & Wydhooge, 2000; Hill et al., 1994; Wood et al., 1996; Thomas et al., 2000; Shapiro et al., 1997).

Research indicates that standards of beauty and acceptance of adiposity are influenced by social, cultural and economical factors (Snooks & Hall, 2002; Crandall & Martinez, 1996). Thus, children's perceived body size and ideal body image vary across cultures, races, and ethnicities (Crandall & Martinez, 1996; Contento et al., 2003; Snooks & Hall, 2002). For example, many non-Western countries around the world value plumpness over thinness, and in these societies there is a greater acceptance of adiposity compared to Western countries (Mokhtar et al., 2001; Prentice & Webb, 2006; Brown & Konner, 1987). Racial groups also indicate different perceptions of ideal body image. For example, young African American females have been found to have greater acceptance of their body size, as well as a preference for a larger body size compared to White and Hispanic adolescents (Perry et al., 2004; Thompson et al., 1997; Rucker & Cash, 1992).

Parental beliefs about current and ideal body size of their children may have a strong impact on children's body image perceptions (Thompson & Smolak, 2001; Cuadrado et al., 2000; Austin, 2000). Children in pre-adolescent and adolescent years are especially vulnerable to parental evaluations of their weight and body size (Contento et al., 2003; Smolak et al., 1999; Klesges et al., 1986). In addition, females and older

children tend to be negatively influenced by parental body image beliefs to a greater degree than males and younger children (Striegel-Moore and Kearney-Cooke; 1994). Because parental perceptions of body size and ideal body image are influenced by several factors, including family and media, parental perceptions of body size may vary across different cultural groups (Contento et al., 2003). For instance, a cross-sectional study of Latino mothers and their young children indicated that most of the Latino women did not perceive their overweight children as plump or unhealthy (Contento et al., 2003). Similar study by Baughum et al. (2000) found that a sample of women was able to evaluate their own weight accurately; however, 80% of them failed to correctly classify their children as overweight. Moreover, differences in perceived and ideal body image perceptions are likely to exist between parents and children in various cultures.

While previous research has established evidence that body image varies across different cultural, racial, and ethnic groups (Snooks & Hall, 2002; Crandall & Martinez, 1996), little is known about body image perceptions and body satisfaction of children in Eastern European countries. For example, how do body image perceptions of Czech children compare to the perceptions of children from Western societies? Children in post-communist Czech Republic are in a unique situation in terms of cultural standards of beauty and acceptance of a certain body size. While there is a lack of literature on body image and body size satisfaction within this post-communist society, Czech children are increasingly exposed to the Western trends, including Western standards of beauty with lower acceptance of adiposity (Humenikova, 2003; Keski-Rahkonen, 2005). We explore these issues and extend the research further by comparing the perceptions of Czech children to those of children from the United States. The main purpose of this study was

to evaluate body image perceptions and body size satisfaction among Czech school-aged children and their parents and compare them to the perceptions of American children and parents.

Methodology

A cluster sampling technique was utilized to recruit school-aged children and their parents in Oklahoma City, Oklahoma, and Pilsen and Prague in the Czech Republic. Parents and their children attending fourth, fifth, or sixth grade were recruited for the study in elementary and/or middle schools. The study was approved by the Institutional Review Board at Oklahoma State University and the Ethical Institute of the Charles University in Prague.

To obtain a sample of American children and parents, a list of all elementary and middle schools with 10 to 90% of children receiving free or reduced lunch in the chosen county was obtained from the Oklahoma State Department of Education website and several schools were randomly selected (Oklahoma State Department of Education, 2005). In the Czech Republic., a combination of random and convenience sampling was used to recruit the schools. A list of all elementary schools was obtained from a phonebook and several schools were randomly selected in Pilsen. One elementary school in Prague volunteered to participate in the study. Informed written consent was obtained from the principal at each school.

In the U.S., a detailed description of the study, a parental written consent, and the Parent Questionnaire (PQ) were distributed to parents through their children. In the

Czech Republic, parents were informed about the study and asked to participate with their child during a parent meeting at school or materials were sent home with the child. Parents who were interested in participating were asked to return a signed written consent and the completed questionnaire to a teacher through their child within four days. After collecting the completed Parent Questionnaires from parents, the questionnaires were coded and parent's names were removed from the questionnaires to protect confidentiality of the subjects.

The Parent Questionnaire included questions about demographic and socio-economic status, and body image perceptions of parents. Parental perceptions of a child's body size were measured using a silhouette body image instrument that was successfully used in previous research (Collins, 1991). Parents were asked to look at several pictures of children of different body shapes and mark their response on an interval scale ranging from 1 to 7 that was underneath the pictures. Parents were asked two questions: "Which picture represents the body shape you think most looks like your child (how you would evaluate your child's body weight)?" and "Which body shape do you think looks closest to the body shape that would be ideal for your child?"

Prior to data collection, all children were asked to sign an assent form for their participation in the study. Children's height, weight, and body image perceptions were collected during one visit at each school. Four volunteer research assistants assisted with collecting data from children in both countries. Prior to any data collection, the assistants were given a detailed description of the study and were trained on how to measure children's height and weight, and how to complete the Body Image Instrument with children. Children's height and weight were measured in the morning hours at each

school and children's privacy was ensured during measurements. Children's weight was measured using an electronic scale (Taylor Precision Performance, Oak Brook, Illinois, USA) with a stable weighing platform. Children were weighed lightly dressed and without shoes. Children's weight was measured in kilograms to the nearest 100 grams while their weight was equally distributed on the scale. Height was measured using a flexible tape while their head, back, and buttocks were touching a vertical wall behind them. Height measurements were taken to the nearest 0.5 centimeter. Both measurements were performed according to the CDC recommendations for measuring stature in children and adolescents (United States Department of Health and Human Services (USDHHS), 2006).

Children answered two questions related to their body image perceptions using the same Body Image instrument that was included in the Parent Questionnaire. The questions were adapted from a study by Collins (1991) and slightly modified. Each child was asked to look at several pictures of different body sizes and specify which body size corresponded to their current body size and which picture represented their ideal/favorite body size. Children's responses were marked on the same interval scale that was used for parents. The two questions were as followed: "Which picture below represents the body shape you think most looks like you?" and "Which picture below represents the body shape you think looks closest to your favorite body shape for a girl/boy your age?"

Information collected from the Parent Questionnaires was used to measure and compare several variables between American and Czech parents. In addition to parental demographic and socio-economic characteristics, parents' self-reported height and weight were used to calculate parental BMI as wt/ht^2. Household income reported by parents in

both countries was classified into two categories: "below average" and "above average," and the educational level of parents was analyzed in four different categories, including elementary, vocational, secondary and university education. Responses to the Body Image Instrument were analyzed and compared between American and Czech parents and children as interval variables ranging from 1 to 7. Children's Body Mass Index was calculated as wt/ht^2 from children's weight and height measurements. The percentile of Body Mass Index was calculated for each child using age and gender specific growth charts developed by the U.S. Centers for Disease Control and Prevention (Centers for Disease Control and Prevention (CDC), 2002). The CDC growth charts were also used to classify children as normal weight (5^{th}-84^{th} percentile), at risk for overweight (85^{th}-94^{th} percentile), and overweight ($\geq 95^{th}$ percentile).

Statistical Analysis

Descriptive statistics were used to describe the sample in terms of parental age, education, income and BMI status. Children's age, gender, grade, percentile of BMI-for-age, and body image perceptions were also reported. Perceived and ideal body image perceptions were compared using independent t-tests between American and Czech parents and children. Differences between perceived and ideal body image perceptions within each child and parent were compared using paired t-tests. Bivariate correlations between children's ideal body image and demographic and socioeconomic characteristics, parental BMI and parental ideal body image were used to identify significant associations between the individual variables.

The Statistical Package for Social Sciences (SPSS 12.0, version for Windows, 2003) was used to conduct statistical analyses in this study. The level of significance was set at 0.05 for all statistical tests performed in the study.

Results

The sample of 45 American children included 15 males and 30 females with 9 children in the fourth grade, 7 children in the fifth grade, and 29 children in the sixth grade. The sample of 97 Czech children consisted of 55 girls and 42 boys with 27 children in the fourth grade, 43 children in the fifth grade, and 27 children in the sixth grade. There was no difference in the mean percentile of BMI-for-age between American and Czech children.

Age and BMI of parents and children in both countries are summarized in Table 6.1. The education level of parents significantly differed by nationality in that more than 70% of American parents had a university education while about half of Czech parents had a high-school education (57%) ($p<0.001$). Although there was no significant difference in household income ($p=0.124$), a larger proportion of Czech households had a mean household income below the national average (38% vs. 27%). American parents were significantly heavier than Czech parents (Table 6.1).

The perceived body image of American and Czech children and parents was similar (Table 6.2; $p=0.596$; $p=0.08$). Both American and Czech children indicated that their ideal body image was smaller than their perceived body image. However, a greater discrepancy between the perceived and ideal body images was found among American

children (Table 6.3; $p<0.01$ vs. $p<0.05$). Overall, the ideal body image of American children was significantly thinner compared to Czech children (Table 6.2; $p<0.05$).

Although there was no significant difference in the parental body images of children between American and Czech parents, Czech parents tended to perceive their children as slightly heavier than American parents ($p=0.08$; Table 6.2). Among American parents, there was no difference between perceived and ideal body images ($p=0.271$). In contrast, Czech parents desired a smaller body size for their children (Table 6.2; $p<0.05$).

In both countries, children's ideal body image was positively associated with their perceived body image (Table 6.3; $p<0.001$), and the parental ideal and perceived body images (Table 6.3). Interestingly, parental education was significantly negatively correlated with children's ideal body image only among American children (Table 3). Similarly, household income tended to be negatively associated with children's ideal body image; however, this trend was observed only among American children (Table 6.3).

Table 6.1 Age and BMI of parents and children by nationality

	Nationality		
Characteristic	American (n=45)	Czech (n=97)	P-value
	Mean±SE	*Mean±SE*	
Parents			
Age (years)	39.3±0.9	37.3±0.5	0.013*
BMI	25.1±0.9	22.8±0.4	0.005**
Children			
Age (years)	10.8±0.2	11.0±0.1	0.333
BMI percentile	56.9±4.5	54.1±2.9	0.587

*$p<0.05$; **$p<0.01$

Table 6.2 Perceived and ideal body image of children by children and parents by nationality

Body Image	American	Czech	p-value
Children			
Perceived	3.32±0.12	3.39±0.07	0.596
Ideal	2.99±0.10	3.26±0.05	0.014*
p-value	0.004**	0.02*	
Parents			
Perceived	3.08±0.13	3.35±0.08	0.081
Ideal	3.20±0.10	3.22±0.06	0.858
p-value	0.271	0.018*	

*p<0.05; **p<0.01

Table 6.3 Association of children's ideal body image with demographic and socioeconomic characteristics, parental BMI and parental ideal body image

Variables	American		Czech	
	Pearson's Correlation	p-value	Pearson's Correlation	p-value
Child's Perceived Body Image	0.584	<0.001	0.655	<0.001
Child's BMI percentile	0.205	0.183	0.107	0.303
Child's Age (years)	0.057	0.714	0.022	0.831
Parental Perceived Body Image	0.366	0.017	0.379	<0.001
Parental Ideal Body Image	0.371	0.015	0.351	0.001
Parental BMI	-0.031	0.847	0.041	0.700
Parental Education	-0.317	0.043	0.067	0.527
Household income	-0.295	0.065	0.035	0.752

Discussion

The main objective of our study was to compare the perceived and ideal body images between Czech and American school-aged children and their parents. Our study showed that American and Czech children were similar in their perceptions of body size.

This result was consistent with our finding that there was no difference in children's BMI percentile based on nationality. While the ideal body size of both American and Czech children was smaller than their perceived body image, our results showed that the ideal body image of American children was significantly thinner than that of Czech children. Some researchers have recently suggested that children and adolescents from former communist countries are more likely to develop an unhealthy body image compared to children from other Western countries (Nasser et al., 2001; Sarlio-Lahteenkorva et al., 2003; Pecova & von Wietersheim, 2005). However, our findings suggest that, although children from the U.S. and Czech Republic believe the ideal body size is smaller then their current size, a greater dissatisfaction with body size exists among American children. The larger ideal body image and a greater body size satisfaction among Czech children may be explained by the historical, social, and cultural differences between American and Czech societies. Our findings suggest that even though Czech children have been increasingly exposed to Western standards of beauty since 1989, Czech children are less likely to be influenced by the emphasis on thinness that dominates the U.S. and other Western societies in Europe.

In terms of the family environment, parents have a tremendous impact on their children's body image perceptions and body size satisfaction (Thompson & Smolak, 2001; Cuadrado et al., 2000; Gralen et al., 1990; Austin, 2000). Previous research has indicated that children's perceptions of ideal body size and the desire to lose weight are strongly influenced by their parents' attitudes, behaviors, and direct comments regarding their own or their children's weight (Smolak et al., 1999; Klesges et al., 1986; Contento et al., 2003). Czech parents preferred their children to be thinner while American parents

were satisfied with their children's body size. Because the ideal body image of American and Czech parents was nearly identical, the dissatisfaction of Czech parents was rooted in their larger perceptions of body size rather than a preference for a thinner body size.

According to previous research, higher socioeconomic status is correlated with a smaller ideal body image and a greater risk for eating disorders in many countries, regardless of the cultural background (Rogers et al., 1997; Soh et al., 2006). However, our study found that ideal body image was negatively associated with the parental education level only among American children. Similarly, household income tended to be negatively associated with American, but not Czech children's ideal body image.

This is the first study to explore the body image perceptions of school-aged children in post-communist Czech Republic. Moreover, our study extends the existing knowledge on body image by comparing the body image perceptions of Czech children to the perceptions of children in the U.S., a Western society in which thinness and dieting has become a predominant social norm. While the evaluation of body image perceptions among children has limitations, the presentation of silhouette drawings of same-sex body size (Coughlin et al., 2003) allowed us to evaluate and compare the perceived and ideal body images between American and Czech school-age children and their parents. The results of our study indicated that the pressure on children to look thinner exists within both American and Czech societies. However, while American parents were pleased with the body size of their children, American children wanted to look thinner. Such dissatisfaction with body weight may increase children's risk of developing unhealthy dietary habits and subsequent eating disorders in the future (Stice et al., 2000; Kelly et al., 1999; Coughlin et al., 2003; Patton et al., 1990).

Realistic ideal body image and body size satisfaction are essential for the development of healthy dietary habits and the prevention of eating disorders among children. Therefore, further research investigating the perceived and ideal body image perceptions of children and parents in the U.S. as well as the Czech Republic is warranted. Future studies should determine what factors are responsible for American children developing a smaller ideal body image compared to Czech children. In addition, future research should contribute to our better understanding of parental beliefs about children's current and ideal body size and factors that influence them in both countries.

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CHAPTER VII

CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Conclusions

The development of obesity in childhood is likely influenced by a variety of dietary, behavioral and environmental factors that continuously influence each other within a child's environment (Bandura, 1978). Although previous research identified several behaviors that may increase children's risk for becoming overweight, the prevalence of child obesity in the U.S. continues to grow. In contrast, the prevalence of overweight children in the Czech Republic was reported to be relatively low compared to the U.S. and many other countries (Lissau et al., 2004). Because a variety of cultural, social, and economic differences between the U.S. and the Czech Republic, the main goal of our study was to evaluate and compare differences in dietary intakes, physical activity, and social and physical environmental factors between American and Czech children and parents and identify factors that may be responsible for the lower obesity rates among Czech children.

Hypotheses 1, 2, and 3

The results of our study supported our hypotheses that American children would consume larger amounts of energy, fat, and energy derived from fat; eat fewer fruits and vegetables; and visit fast food restaurants more often than Czech children. The higher intake of energy and fat in the U.S. may be caused by more frequent dining in fast food restaurants among American children and lower availability of fruits and vegetables in American households.

Hypotheses 4, 5, and 6

The findings of our study supported the hypothesis that American children would have a significantly smaller ideal body image than Czech children. However, the results of our study did not support the hypothesis that American children perceived themselves as heavier compared to Czech children. It appears that American children want to look thinner not because they perceive themselves heavier than Czech children, but because their ideal body image is smaller compared to Czech children. In terms of parent-child comparisons of the ideal body image, there were no differences in ideal body image between children and parents in either country. Thus, our hypothesis that the ideal body image of American children differs from the ideal body image of their parents was not supported. Because children and parents are exposed to similar cultural, social, and environmental influences, this finding was not surprising.

Hypothesis 7

Our study indicated that American children spend less time in moderate physical activity than Czech children, which was supportive of our hypothesis that American children are less active than Czech children. However, the findings only partly supported our hypothesis because American children spent similar amounts of time in vigorous activities as Czech children. This finding may be explained by the popularity of organized sports in the U.S. that provides opportunities for vigorous-type activities among school-aged children. In addition, differences in the lifestyle and education structure between the U.S. and the Czech Republic, such as less amount of time spent at school, may be responsible for Czech children obtaining a greater amount of moderate exercise compared to American children.

Hypotheses 8 and 9

The findings of our study did not support our hypothesis that American parents would be less likely to use an authoritative parenting style than Czech parents. Given the high obesity rates among American children, we expected American parents to be more likely to use one of the parenting styles that has been associated with poor dietary habits among children, such as permissive or authoritarian parenting style.

Our findings partially supported the hypothesis that American parents would be less involved in meal preparation for their children than Czech parents. While Czech parents prepared breakfast, lunch, and snacks for their children more often than American

parents, parents in the U.S. appeared to be more involved with dinner preparations. This unexpected finding may be explained by the fact that dinner represents the main meal of the day in the U.S., while lunch is the most important meal of the day in the Czech Republic.

Hypothesis 10

Our study supported the hypothesis that healthy foods would be more available in Czech than American households. With the exception of low-fat dairy products, the availability of fruits and fresh and frozen vegetables was significantly higher in Czech households.

Hypothesis 11

Our study did not support the hypothesis that children's BMI-for-age would be predicted by nationality, parental BMI and education, children's energy and fat intakes, fruit and vegetable intakes, moderate and vigorous physical activity, parenting style, food socialization and preparation practices of parents. The regression model did not predict a significant proportion of variance in children's BMI-for-age z-scores. Parental BMI was the only variable that was significantly correlated to children's BMI-for-age z-score within the sample of American and Czech children. The failure to support our hypothesis can be explained by a limited sample size, especially in regard to the sample of American children and parents.

Implications

The results of our study indicate that significant differences in children's dietary quality, physical activity, and environmental factors that influence the development of child obesity exist between the U.S. and the Czech Republic. While no significant difference in children's BMI-for-age was found between American and Czech children in our sample, the higher dietary quality and greater physical activity among Czech children are likely responsible for the lower prevalence of obesity among young Czech adolescence that was found in previous research (Lissau et al., 2004). Although we were unable to identify significant predictors of children's BMI-for-age in the two countries, the findings of our study show that the higher dietary quality among Czech children may be contributed to several physical and social environmental factors, such as a greater availability of healthy foods and more frequent involvement of parents in meal preparations.

The findings of our study may be used to design effective obesity prevention interventions for American school-aged children and their parents. While educating children about healthy dietary habits and regular exercise is important, nutritionists and other health professionals working with families should put a strong emphasis on social and physical environmental factors that influence children's dietary intakes and exercise habits. For example, future interventions should focus on increasing parental involvement in the preparation of breakfast, snacks, and lunch for their children. Attention should also be paid to the importance of making healthy foods available and accessible to children, not only within the family environment, but also at schools and

after-school programs. In addition to creating physical environment that would encourage healthy eating habits among children, future interventions should focus on encouraging the utilization of positive food socialization practices among parents. As our findings indicated, certain food socialization practices, such as negative explanations used to discourage the consumption of a particular food, may associated with higher BMI-for-age among children. Thus, parents should focus on the utilization of positive explanations and reasoning in order to encourage the development of healthy dietary habits among their children.

As child obesity rates continue to rise in the Czech Republic, our study contributes to the limited knowledge on dietary intakes and physical activity of Czech elementary school-aged children. Although the fruit and vegetable consumption of Czech children was significantly higher than in the U.S., Czech children still consumed less than the recommended amount of fruits and vegetables. Based on the results of our study, nutritional professionals working with Czech school-aged children should evaluate and regularly monitor children's fruit and vegetable intakes. In addition, they should attempt to incorporate other healthy sources of dietary fiber, such as whole wheat grains, into children's diets. Furthermore, nutritional professionals working with Czech children and their families should evaluate the level of parental knowledge and skills related to the preparation of fruit and vegetable snacks and meals and teach parents how to incorporate more fruits and vegetables into their children's dietary plan.

Recommendations

Our study offers a unique cross-cultural examination of dietary intakes, physical activity, and environmental factors that influence children's BMI in the U.S. and the Czech Republic. As our findings indicated, American and Czech children differ not only in terms of their dietary intakes, but also in their level of physical activity. Interesting differences were also apparent in the parenting style, food socialization practices, food preparation practices, and food availability between American and Czech parents. Our study has implications for further investigation and comparison of factors that contribute to children's BMI-for-age both in the U.S. and the Czech Republic. Recommendations for future research related to dietary intakes, physical activity, and other factors influencing the risk for overweight among American and Czech children are outlined below.

The dietary intakes, physical activity and social and physical environmental variables that were explored in our study should to be further investigated with a large sample of American and Czech children and parents. Although our sample size was sufficient for the current study, additional research is warranted with a large, if possible nationally representative, sample of American and Czech children and parents from both urban and rural areas. In addition to obtaining more accurate estimates of children's dietary intakes, physical activity, and parental behaviors in both countries, a large sample size would allow to determine and compare significant predictors of children's BMI-for-age between the U.S. and the Czech Republic. In addition, because our sample of American children was recruited from schools with more than 10% and less than 90% of

students receiving free or reduced-price lunch, the findings of our study cannot be generalized to children from very low and very high socio-economic status. Additional research should explore the dietary, exercise, and environmental factors that influence children's dietary intakes and BMI-for-age in pediatric populations of diverse socio-economic background in the U.S.

In terms of social environmental factors, researchers interested in parental influences on children's dietary intakes and their risk for overweight should further explore the nature of food socialization practices and parenting styles that are associated with positive dietary outcomes and lower BMI-for-age among children. As our study indicated, permissive parenting style is associated with higher BMI-for-age among American children while negative explanations used to discourage the consumption of a particular food are related to higher BMI-for-age among Czech children. Future studies should focus on improving validity and reliability of the food socialization practices and parenting style scales that would allow practitioners and researchers to evaluate parental behaviors as they relate to children's dietary habits and BMI-for-age.

Our study also identified important trends in the dietary intakes of Czech school-aged children. The role of fruits and vegetables in children's diets and their benefits in terms of obesity prevention has been emphasized in previous research (Rolls et al., 2004; Dennison et al, 1998). Despite obvious benefits of fruit and vegetable consumption, children in the Czech Republic do not consume enough fruits and vegetables on a regular basis (Parizkova, 2000). Nutritional professionals in the Czech Republic should focus on improving the dietary habits among school-aged children and address the inadequate consumption of fruit, vegetables, and fiber in future nutrition interventions. Based on the

results of our study, the availability of fruits and vegetables is relatively high in Czech households. Thus, parents, nutritionists, and other health professionals should attempt to increase children's exposure to fruits and vegetables outside of the home environment. For example, a nation-wide nutrition program aimed at increasing the consumption of fruits and vegetables among children should be implemented in public elementary schools in the Czech Republic. In addition to increasing the availability and accessibility of fruits and vegetables in school cafeterias, vending machines, and buffets, the nutrition program should also incorporate other environmental changes that would stimulate children's interest in fruits, vegetables, and other healthy foods, such as low-fat dairy products and whole-wheat breads.

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APPENDICES

APPENDIX A

Oklahoma State University Institutional Review Board

Protocol Expires: 4/4/2005

Date: Monday, April 05, 2004 IRB Application No HE0454

Proposal Title: Factors Influencing BMI of School-aged Children in the Czech Republic

Principal Investigator(s):

Lenka Humenikova
105 N. Stallard
Stillwater, OK 74074

Gail Gates
101 Whitehurst
Stillwater, OK 74078

Reviewed and Processed as: Expedited (Spec Pop)

Approval Status Recommended by Reviewer(s): Approved

Dear PI :

Your IRB application referenced above has been approved for one calendar year. Please make note of the expiration date indicated above. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact me in 415 Whitehurst (phone: 405-744-5700, colson @ okstate.edu).

Sincerely,

Carol Olson, Chair Institutional Review Board

Oklahoma State University Institutional Review Board

Date: Thursday, November 11, 2004

IRB Application No HE0510

Proposal Title: Cross-Cultural Comparison of Factors Influencing Body Mass Index in Czech and U.S. School-aged Children

Reviewed and
Processed as: Expedited (Spec Pop)

Status Recommended by Reviewer(s): Approved Protocol Expires: 1111012005

Principal
Investigato
rs

Lenka Humenikova
105 N. Stallard
Stillwater, OK 74074

Gail Gates
101 Whitehurst
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact me in 415 Whitehurst (phone: 405-744-1676, colson@okstate.edu).

Sincerely,

Carol Olson, Chair
Institutional *Review* Board

APPENDIX B

ETICKA KOMISE,

3. LEKARSKE FAKULTY UMVERZITY KARLOVY V PRAZE

ETHICS COMMITTEE OF THE 3RD FACULTY OF MEDICINE, CHARLES UNIVERSITY IN PRAGUE
RUSKA 87, 100 00 PRAHA 10

Ms
MS Lenka Humenikova

Dpt. of Nutrition, CPM, 3. LF UK

Oklahoma State University

Prague, 11.1.2005.

Ethical Commission Statement

The project „Cross cultural comparison of factors influencing body mass index in the Czech Republic and in US school aged children", which was submitted by Lenka Humenikova was approved.

Etická komise
3. lékarské fakulty
Univerzity Karlovy v Praze
100 00 Praha 10, Ruská 87

Doc. MUDr. Jiri Simek, CSc.
Chairman of the Ethics committee of the
3rd Faculty of medicine

APPENDIX C

Written Consent of Principals

I have reviewed all of the materials related to the study being conducted by Lenka Humenikova from Oklahoma State University (contact information: (405) 377-3873 or email: lenka.humenikova@okstate.edu). As the principal of this school, I authorize Lenka Humenikova to conduct her study. Parents will be contacted and a written consent will be obtained from them. Information from children will be collected after parents give consent for their participation. I was informed about all parts of the study by Lenka Humenikova and I sign my name freely and voluntary. A copy of this informed consent form was given to me.

_____ _____

Principal's Name (please print) Name of the School, City

_____ Date:_____

Signature of the Principal

APPENDIX D

Informed Consent Form for Parents

I,_____, hereby authorize Lenka Humenikova, M.S., to perform the following procedures.

This research project is being conducted by Lenka Humenikova, a Ph.D. student in the Department of Nutritional Sciences at Oklahoma State University. The purpose of the study is to assess diet quality, body image perceptions and physical activity of 4-6th graders in the U.S. and Czech Republic, and to evaluate parent influences on their nutrition status. The results of this study will help identify and compare factors that influence dietary habits of children in both countries. The results of this study will also help design more effective interventions to improve nutrition status among school-aged children in the U.S.

During the study, mothers (fathers if primary care takers) will be asked to complete a questionnaire that includes questions related to foods usually found in a household, body image perceptions, behaviors related to a child's food intake, and basic information such as age, gender etc. The completion of the questionnaire will take approximately 15-20 minutes. Information from children will be collected on two individual days during regular school time. Children will be asked to remember what they ate and drank on two different days, and they will answer questions related to their body image perceptions and physical activity. In addition, height and weigh of children will be measured (dressed without shoes). There will be no follow-up procedures and there is no risk in participating in this study for you and your child.

The participation in the study is voluntary. If your child feels uncomfortable while reporting any information, he/she can choose not to answer any question, or to withdraw completely from the study at any time. You have also the right to withdraw the consent for either yourself or your child at any time by notifying the child's teacher. There is no penalty for refusal to participate. You and/or your child can ask questions to the primary investigator, Lenka Humenikova, at any time or contact her by telephone at 011-420-377-378-492 (001-405-377-3873 in the U.S.) or email at lenka.humenikova@okstate.edu.

All information collected from parents and children will be kept confidential. No one will be able to connect parents' or children's names with the collected data. Both parents and children will be assigned code numbers which will serve as the only way for identifying subjects during the study. All names and other personal information will be kept in a locked file cabinet and only the primary investigator will have access to this information.

This study has been reviewed and approved by the Oklahoma State University Institutional Review Board (IRB). You have the right to contact the Institutional Review Board Chair, Dr. Carol Olson to discuss any questions related to rights of human

subjects, at 415 Whitehurst, Oklahoma State University, Stillwater, OK 74078; telephone 001-405-744-5700.

I have read and I fully understand this informed consent form. The primary investigator, Lenka Humenikova, has fully explained the study and I agree to participate in this study. I also give consent for my child. I sign my name freely and voluntarily. A copy of this informed consent form was given to me.

_____

Date:_____

_____
Parent Signature

Child's Name (Print Clearly)_____

_____

_____

_____

I certify that I have personally given the full description of the study and I have explained the nature of the participation to the subject or his/her legal representative before asking to sign this form.
Signed:_____
PI or authorized assistant

APPENDIX E

Assent Form for Children

I agree to participate in a study about my dietary habits.

I agree to recall what I ate and drank during a previous day on two different days and answer questions about my physical activity and body image. I also agree that my weight and height will be measured.

I can tell my teacher if I do not want to do this anymore.

_____Yes, I want to help.

_____No, I do not want to help.

APPENDIX F

Parent Questionnaire

Study by

Lenka Humenikova
Oklahoma State University
Spring & Summer 2005

Contact Information
Lenka Humenikova
Phone: (405) 377-3873
Email: lenka.humenikova@okstate.edu

Dear parent, thank you for participating in this study. Your responses to the following questions are extremely important for determining what factors influence children's dietary intake and body weight, so please answer as accurately as possible. Refer these questions to the child that will be participating in this study with you.

Please circle one of the answers corresponding to each question.

	Never	Sometimes	Often	Always
1. I make sure my child tells me where he/she is going.	1	2	3	4
2. I tell my child when she/he does a good job on things.	1	2	3	4
3. I tell my child that I like him/her just the way she/he is.	1	2	3	4
4. I can be talked into things easily.	1	2	3	4
5. I am interested in my child's school work.	1	2	3	4
6. I check to see if my child does his/her homework.	1	2	3	4
7. I ask my child what he/she does with friends in leisure time.	1	2	3	4
8. I forget the rules I make for my child.	1	2	3	4
9. It is hard for me to say "no" to my child.	1	2	3	4
10. I am usually pleased with how my child behaves.	1	2	3	4
11. I tell my child times when she/he must come home.	1	2	3	4
12. I want to hear about my child's problems.	1	2	3	4
13. I am always telling my child what to do.	1	2	3	4
14. I make my child feel better when she/he is upset.	1	2	3	4
15. I make rules without asking my child what she/he thinks.	1	2	3	4
16. I know where my child is after school.	1	2	3	4

To encourage your child to eat a particular food, how often do you…

	Never	Sometimes	Often	Always
1. …tell your child this food gives him/her energy?	1	2	3	4
2. …tell your child that the food is good for his/her teeth?	1	2	3	4
3. …tell your child that the food is good for him/her?	1	2	3	4
4. …tell your child that he/she will be strong?	1	2	3	4
5. …tell your child it tastes good?	1	2	3	4
6. …tell your child to taste it because it is delicious?	1	2	3	4
7. …tell your child that you will take them somewhere if she/he eats it?	1	2	3	4
8. …tell your child if she/he eats it you will give him/her dessert.	1	2	3	4
9. …let your child see you eat the food?	1	2	3	4
10. …give your child something she/he will like (not dessert).	1	2	3	4
11. …force your child to eat it.	1	2	3	4
12. …take away a privilege from your child (watching TV etc.) if they do not eat it?	1	2	3	4
13. …make something else for him/her if they do not eat it?	1	2	3	4

To discourage your child from eating a particular food, how often do you…….

	Never	Sometimes	Often	Always
1. Get rid of it.	1	2	3	4
2. Tell your child it is not nutritious.	1	2	3	4
3. Tell your child it will make him/her sick.	1	2	3	4
4. Tell your child it is too sweet.	1	2	3	4
5. Give your child something else to do.	1	2	3	4
6. Put it somewhere your child can't find it.	1	2	3	4
7. Tell your child it is too greasy.	1	2	3	4
8. Tell your child it is bad for his/her teeth.	1	2	3	4
9. Say "do not eat it."	1	2	3	4
10. Take away things your child likes to do (privileges) for eating it.	1	2	3	4
11. Give your child a small portion.	1	2	3	4
12. Tell your child it will make him/her fat.	1	2	3	4
13. Just do not give it to your child.	1	2	3	4

In terms of food preparation in your home…….

N=never, S= sometimes, O=often, A=always	**Never**	**Sometimes**	**Often**	**Always**
1. How often do you prepare your child's breakfast?	1	2	3	4
2. How often do you prepare your child's snack?	1	2	3	4
3. How often do you include fruit in your child's snack?	1	2	3	4
4. How often do you give (prepare) vegetables to your child for a snack?	1	2	3	4
5. How often do you prepare your child's lunch?	1	2	3	4
6. How often do you give (prepare) vegetables to your child for lunch?	1	2	3	4
7. How often do you prepare your child's dinner?	1	2	3	4
8. How often do you prepare/serve vegetables for your child's dinner?	1	2	3	4
9. How often do you eat dinner together (as a family) during the week?	1	2	3	4
10. How often do you eat dinner together (as a family) on the weekends?	1	2	3	4

When you are grocery shopping……

	Never	**Sometimes**	**Often**	**Always**
1. I check food labels for ingredients before purchasing a product for the first time.	1	2	3	4
2. I read the nutrition information provided on food packages before purchasing a product for the first time.	1	2	3	4
3. I plan menus before doing my food shopping.	1	2	3	4
4. I make out a list before doing my food shopping.	1	2	3	4
5. I compare prices on several food products when I go food shopping.	1	2	3	4
6. I check the food ads in the newspaper before going food shopping.	1	2	3	4
7. My child goes grocery shopping with me.	1	2	3	4
8. My child asks me to buy certain foods at the grocery store.	1	2	3	4

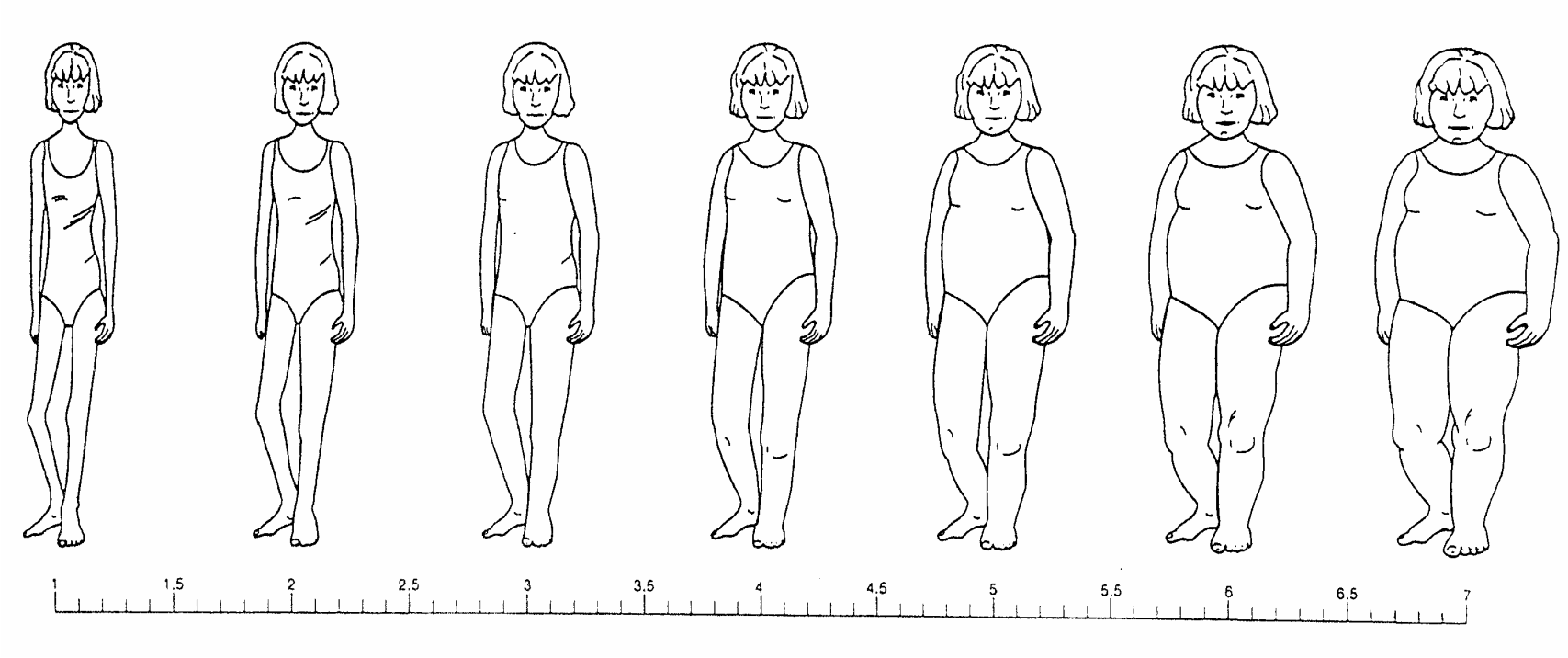
Evaluating Current and Ideal Body Weight of Your Child

Please look at the girl's/boy's shapes on the following pages. Use only 2 out of four pages depending of the gender of your child.

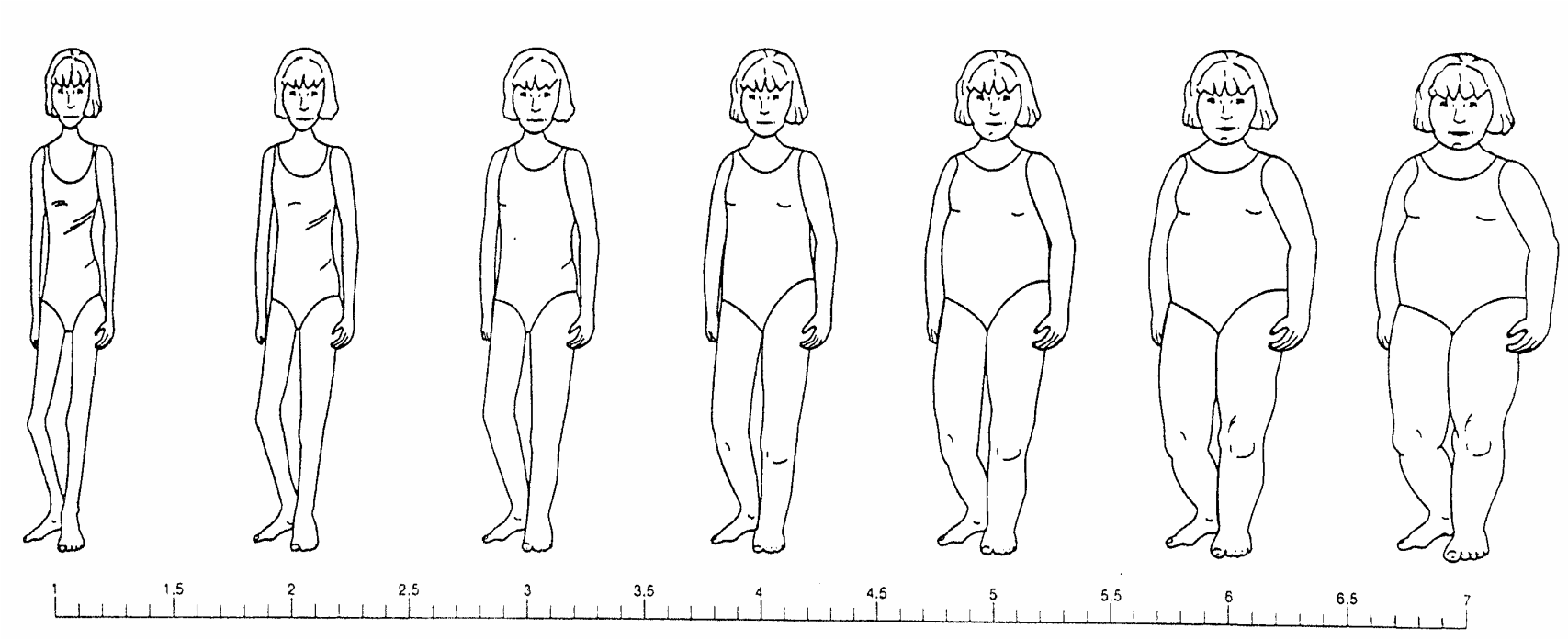
1. **First page**
   Place a mark (cross) on the line below the body shape you think most looks like your child (how you would evaluate your child's body weight). If you can't decide between 2 body shapes put a mark on the line that falls in between the 2 shapes.

2. **Second page**
   Place a mark on the line below the body shape you think looks closes to the body shape you think would be ideal for your child. If you think that your child's weight is already ideal, please mark the same place as on the first page. If you can't decide between 2 body shapes put a mark on the line that falls in between the 2 shapes.

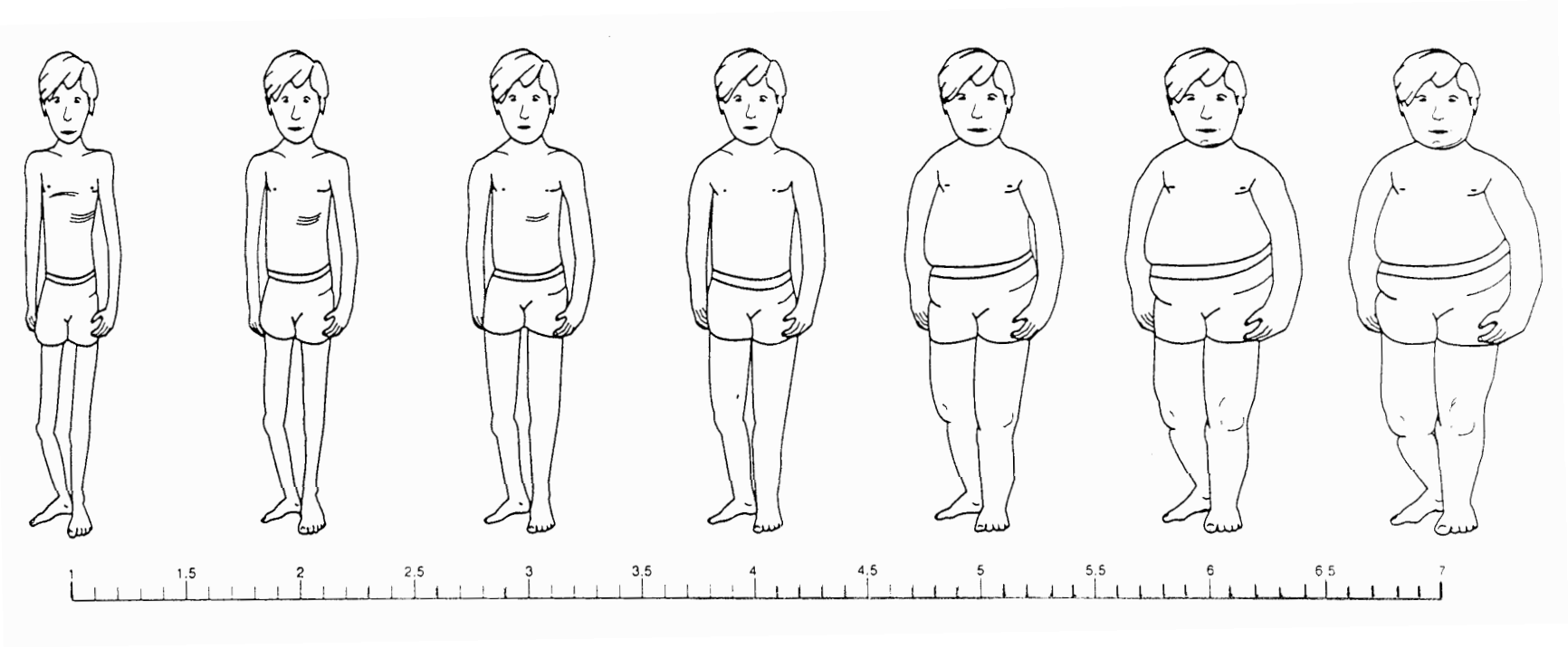
Page 1: Which picture represents the body shape you think most looks like your child (how you would evaluate your child's body weight)?



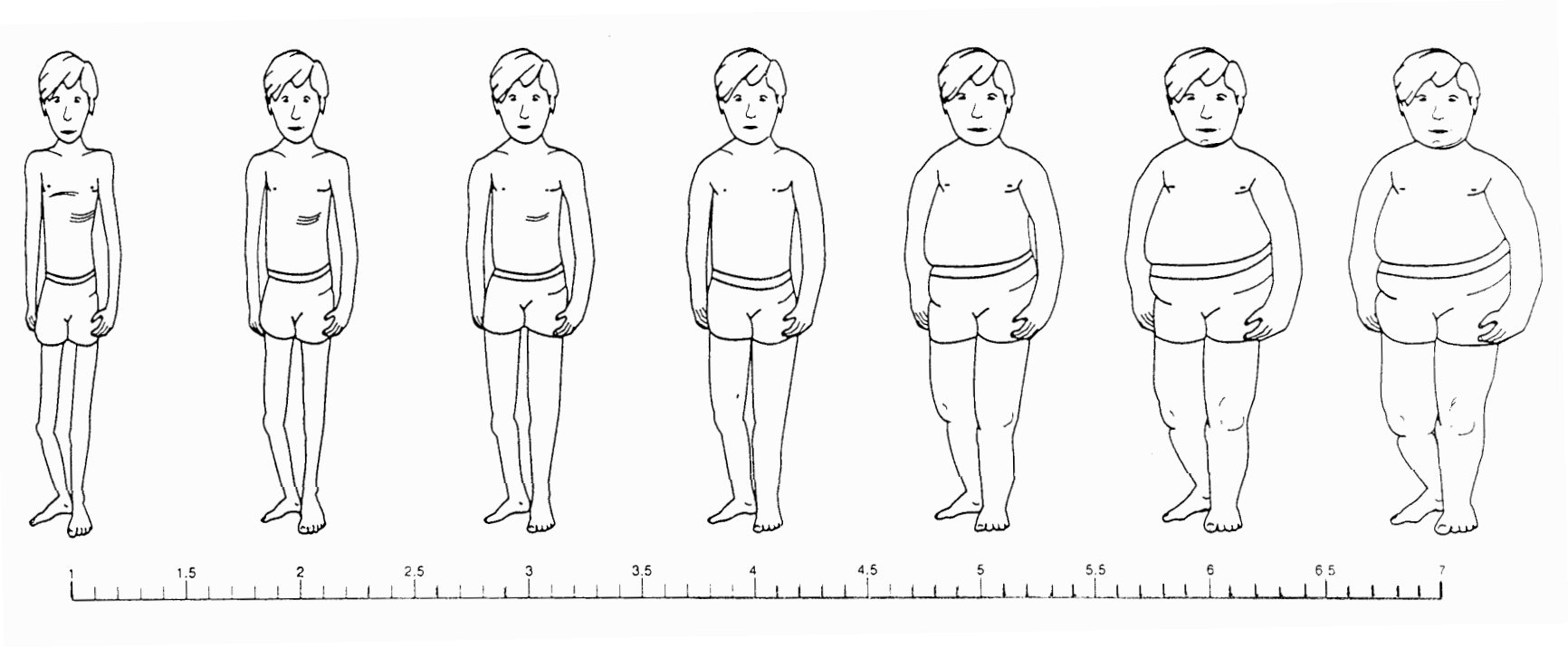
Page 2: Which body shape do you think looks closest to the body shape that would be ideal for your child?



Page 1: Which picture represents the body shape you think most looks like your child (how you would evaluate your child's body weight)?



Page 2: Which body shape do you think looks closest to the body shape that would be ideal for your child?



SHELF INVENTORY

Please use this checklist to tell us which foods are usually present in your home. Be sure to think about all places where you store food. Place a check in the "YES" box when you remember that you have a particular food. Check "NO" box if you do not have that food. Do not count frozen or canned foods unless they are specified.

MILK/DAIRY

Yes	No		Yes	No	
[ ]	[ ]	Whole Milk	[ ]	[ ]	Butter
[ ]	[ ]	2% Milk	[ ]	[ ]	Margarine
[ ]	[ ]	1% Milk	[ ]	[ ]	Light margarine
[ ]	[ ]	Skim Milk	[ ]	[ ]	Puding
[ ]	[ ]	Butter milk	[ ]	[ ]	Sour Cream
[ ]	[ ]	Low-fat Yogurt	[ ]	[ ]	Sour Cream Dips
[ ]	[ ]	Nonfat Yogurt	[ ]	[ ]	Light & Low-fat Sour Cream
[ ]	[ ]	Cream or Half and Half			& Sour Cream Dips

CHEESE

Yes	No		Yes	No	
[ ]	[ ]	Regular cottage cheese (4%)	[ ]	[ ]	Parmesan cheese
[ ]	[ ]	Low fat cottage cheese (1-2%)	[ ]	[ ]	Mozzarella cheese
[ ]	[ ]	Cream cheese			
[ ]	[ ]	String cheese			
[ ]	[ ]	Light cream cheese			
[ ]	[ ]	Cheese food and spreads, Velveeta			
[ ]	[ ]	Low-fat cheese			
[ ]	[ ]	Colby, Cheddar			
[ ]	[ ]	Pimento cheese			
[ ]	[ ]	American cheese			
[ ]	[ ]	Swiss, or Monterey Jack			
[ ]	[ ]	Blue, Brick, Limburger, Muenster, Provolone, Gouda, Brie, Romano cheese			

SALAD DRESSINGS

Yes	No	
[ ]	[ ]	Regular creamy-based salad dressing
[ ]	[ ]	Regular oil & vinegar-based salad dressings
[ ]	[ ]	Reduced Calorie, low fat, nonfat or light dressing
[ ]	[ ]	Regular mayonnaise
[ ]	[ ]	Light mayonnaise
[ ]	[ ]	Tatar sauce

CEREAL

Yes	No				
[ ]	[ ]	Corn flakes	[ ]	[ ]	Oatmeal
[ ]	[ ]	Whole wheat cereal	[ ]	[ ]	Granola
[ ]	[ ]	Other cereal, please specify_____			
		_____			

BREADS, PASTA, RICE

Yes	No	
[ ]	[ ]	Whole wheat or whole grain bread or rolls
[ ]	[ ]	Other brown bread or rolls (rye etc.)
[ ]	[ ]	White breads or rolls
[ ]	[ ]	Brown rice
[ ]	[ ]	White rice
[ ]	[ ]	Pasta/spaghetti
[ ]	[ ]	Whole wheat pasta
[ ]	[ ]	Pancakes

SWEETS

Yes	No				
[ ]	[ ]	Pastry	[ ]	[ ]	Chocolate
[ ]	[ ]	Donuts	[ ]	[ ]	Candy
[ ]	[ ]	Other Cakes or Cookies	[ ]	[ ]	Ice cream/froz. yogurt
[ ]	[ ]	Muffins	[ ]	[ ]	Honey, jam, jelly

FRESH VEGETABLES

Yes	No				
[ ]	[ ]	Peas	[ ]	[ ]	Pepper
[ ]	[ ]	Potatoes	[ ]	[ ]	Lettuce
[ ]	[ ]	Corn	[ ]	[ ]	Romaine lettuce
[ ]	[ ]	Carrots	[ ]	[ ]	Tomatoes
[ ]	[ ]	Brussels sprouts	[ ]	[ ]	Cauliflower
[ ]	[ ]	Spinach	[ ]	[ ]	Cabbage
[ ]	[ ]	Broccoli			

FROZEN VEGETABLES

Yes	No				
[ ]	[ ]	Peas	[ ]	[ ]	Mixed Vegetables
[ ]	[ ]	Potatoes	[ ]	[ ]	Mixed Vegetables
[ ]	[ ]	Corn	[ ]	[ ]	Mixed Vegetables

[ ]	[ ]	Carrots	[ ]	[ ]	Cauliflower
[ ]	[ ]	Brussels sprouts	[ ]	[ ]	Cauliflower
[ ]	[ ]	Spinach	[ ]	[ ]	Cabbage
[ ]	[ ]	Broccoli			

FRESH FRUIT

Yes	No				
[ ]	[ ]	Apples	[ ]	[ ]	Kiwi
[ ]	[ ]	Pears	[ ]	[ ]	Peaches, nectarines
[ ]	[ ]	Oranges	[ ]	[ ]	Plums, cherries etc.
[ ]	[ ]	Bananas	[ ]	[ ]	Grapefruit
[ ]	[ ]	Strawberries (fresh or frozen)			
[ ]	[ ]	Blueberries (fresh or frozen)			

LEGUMES

Yes	No				
[ ]	[ ]	Dried Peas, Beans or Lentils	[ ]	[ ]	Canned Beans
[ ]	[ ]	Refried Beans and Chili with Beans			

MEAT

Yes	No				
[ ]	[ ]	Extra Lean Ground Beef	[ ]	[ ]	Salami
[ ]	[ ]	Lean Ground Beef	[ ]	[ ]	Chicken, turkey
[ ]	[ ]	Regular Ground Beef	[ ]	[ ]	Fish
[ ]	[ ]	Bacon	[ ]	[ ]	Sausage
[ ]	[ ]	Bologna	[ ]	[ ]	Deli ham (pork)
[ ]	[ ]	Frankfurters	[ ]	[ ]	Deli ham (chicken, turkey)

BEVERAGES & OTHER

Yes	No				
[ ]	[ ]	Soft drinks	[ ]	[ ]	Pretzels
[ ]	[ ]	Diet soft drinks	[ ]	[ ]	Chips
[ ]	[ ]	100% Fruit juices	[ ]	[ ]	Nuts
[ ]	[ ]	100% Vegetable juice	[ ]	[ ]	Trail mix
[ ]	[ ]	Other fruit drinks	[ ]	[ ]	Crackers
[ ]	[ ]	Flavored water	[ ]	[ ]	Crackers

Please fill out the following information. The information is confidential and will be only used for matching you and your child in this study:

Your age: _____years **Height:** _____

Occupation:_____ **Weight** _____lb

Female [ ] **Male** [ ]

Education (please mark selected answer)**:**

Elementary [ ]
Vocational school [ ]
High school [ ]
Community college [ ]
Bachelor's degree [ ]
Master's degree [ ]
Doctorate degree [ ]
Others (please specify)_____

Work status (please mark selected answer)**:**

Full-time [ ]
Part-time [ ]
Student [ ]
Retirement [ ]
Maternity leave [ ]
Homemaker [ ]
Unemployed [ ]
Other (please specify)_____

Is there any other adult living with you in your household (spouse, partner, grandmother etc.? Yes [ ] N_____[ ]

If you answered yes to the previous question, what is the occupation of that person?

_____

What range does the yearly income of your entire household fall into?

< $ 35,000 [ ]
$ 36,000- 50,000 [ ]
> $ 50,000 [ ]

Your child's full name:
(child that will be participating in the study): _____

The end of the questionnaire.

THANK YOU!

APPENDIX G

Modified Self-Administered Physical Activity Checklist (SAPAC)

Child Number:_____ Day: _____

Did you participate in physical education class yesterday? Yes No

If yes, how many minutes long was physical education class? ___ (minutes)

Did you participate in a recess yesterday? Yes No

If yes, how many minutes of recess or break did you have? _____

_____

_____

As we complete this form, I want you to know there are no right or wrong answers. We just want to know the physical activities you actually did yesterday. It is important to be very honest.

What activities did you participate in yesterday before school?

What activities did you participate in during school, including recess?

What activities did you participate in after school?

How long did you participate in these activities?

ACTIVITIES

	Activity	Before School	During School	After School
I	Bicycling			
2	Swimming Laps			
3'	Gymnastics bars, beam, tumbling trampoline			
4	Exercise: push-ups, sit-ups, Jumping rope			
5	Weight lifting			
6	Basketball			
7	Baseball'/Softball			
8	Football			
9	Soccer			
10	Volleyball			
11	Skating: ice, roller, roller blade.			
12	Hockey: ice, flock, 2eld			
13	Racket Sports: badminton, tennis, paddleball			
14	Ball Playing: four square, dodge ball, kickball			
15	Active Games: chase, tag, hopscotch			
16	Outdoor Play: climbing trees, hide and seek			
I7	Water Play: (In pool, ocean or lake)			
18	Competitive.judo. karate, competitive wrestling			
19	Dance			
20	Outdoor Chores: mowing, raking. gardening			
21	Indoor Chores: mopping, vacuuming, sweeping			
22	Skateboarding/Scootering (non-motorized):			
* ***We walk and/or run many times throughout the day, often for less than 5 minutes*** *at a* ***time. A good example of this is going from class*** *to* ***lunch. Sometimes*** *we* ***do a combination*** *of* ***walking and running, where we walk some and run some. We call this mixed walking and running.*** *				
23	Mixed Walking/Running			
24	Walking			
25	Running			

OTHER ACTIVITIES:

Now I want you to think about any TV, videos, or DVD you watched, or video or computer games you played... BEFORE SCHOOL AFTER SCHOOL

T.V. Video DVD Video Games & Computer Games	hours plus	minutes	hours plus	minutes
	hours plus	minutes	hours plus	minutes

APPENDIX H

Body Image Instrument for Children

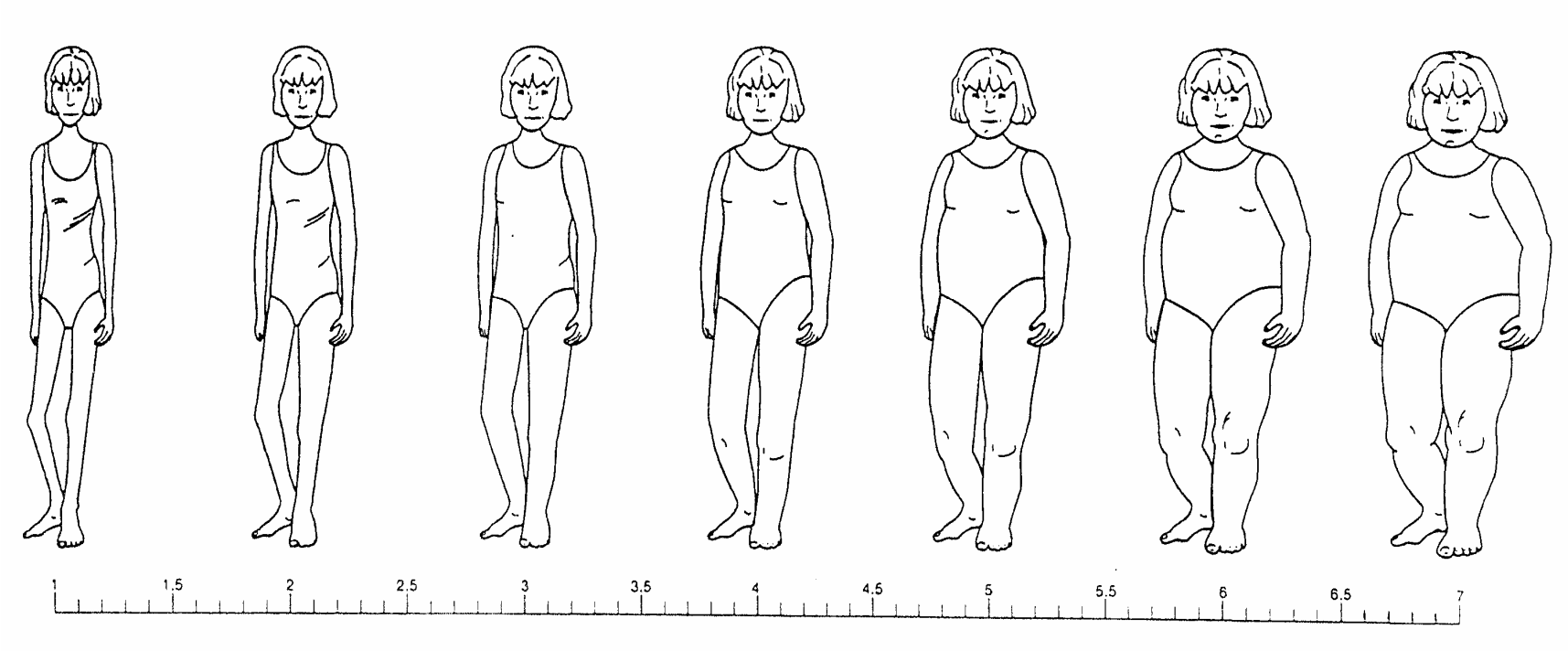
INTERVIEWER SAYS:

1. Now look at the girl's/boy's shapes on this page. Place a mark on the line below the body shape you think most looks like you. If you can't decide between 2 body shapes put a mark on the line that falls in between the 2 shapes.

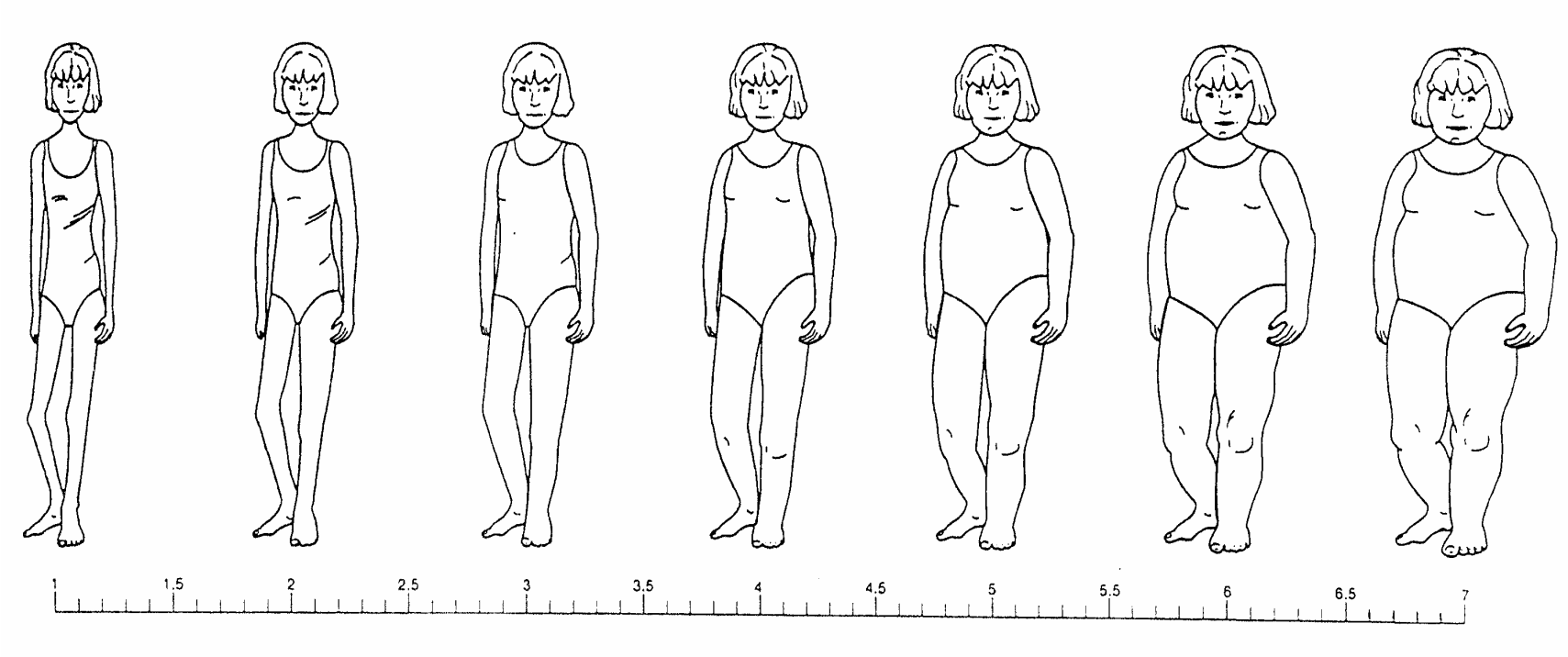
2. Look at the girl's/boy's shapes on this page. Place a mark on the line below the body shape you think looks closes to your favorite body shape for a girl/boy your age. (you like best) If you can't decide between 2 body shapes put a mark on the line that falls in between the 2 shapes.

END OF QUESTIONS FOR CHILD

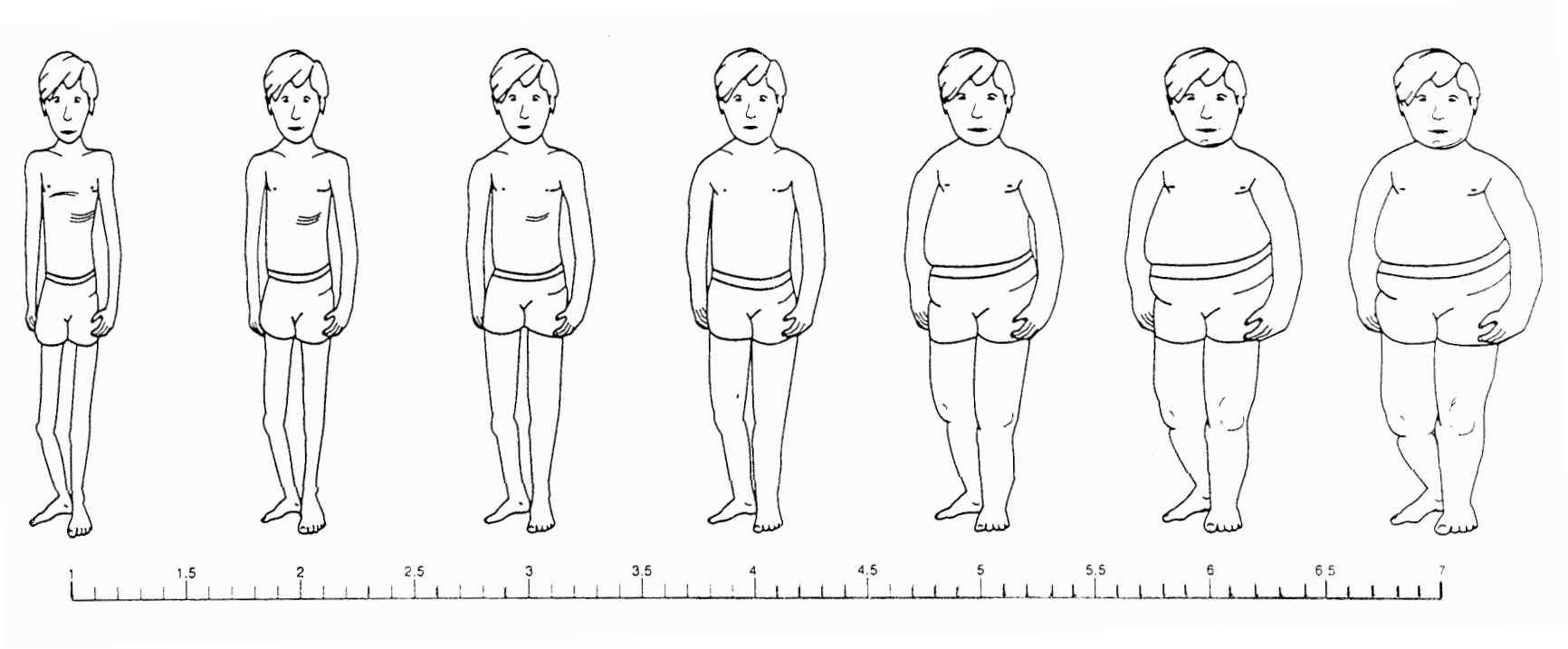
Page 1: Which picture below represents the body shape you think most looks like you?



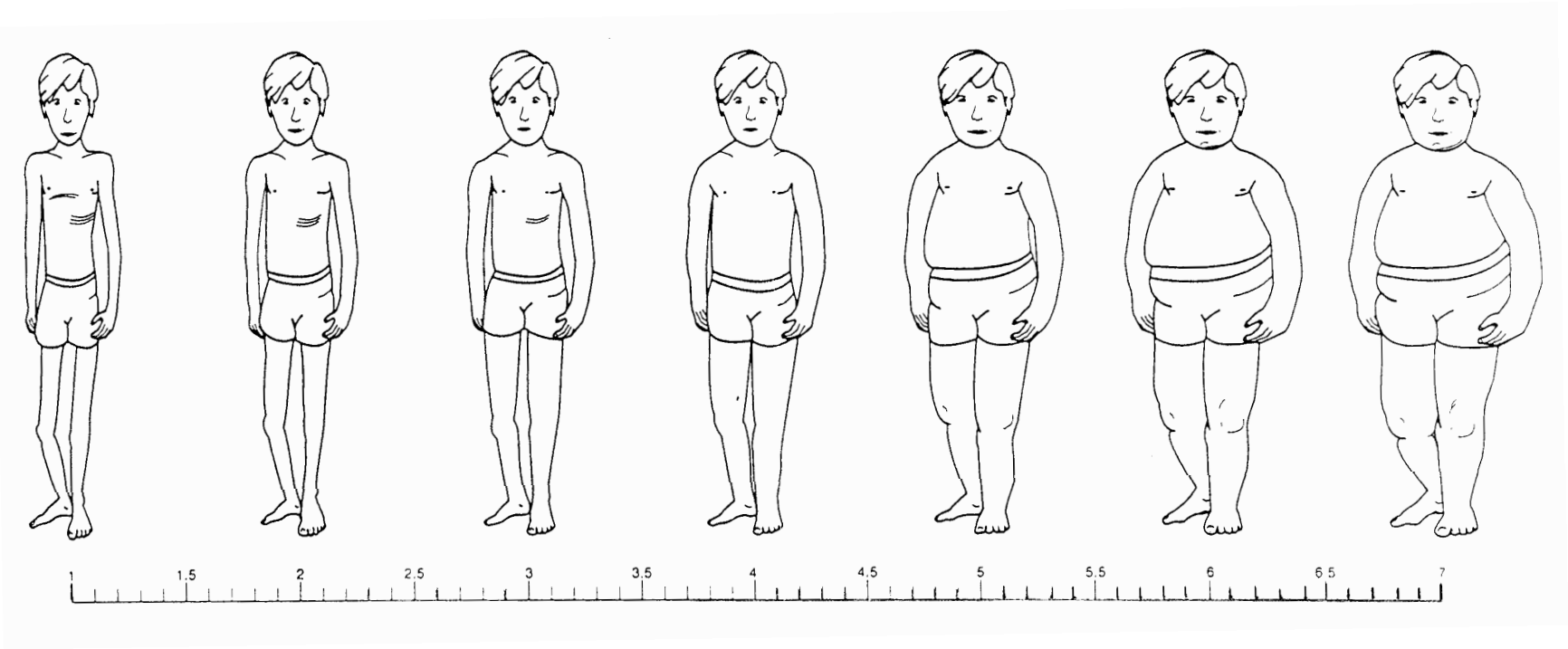
Page 2: Which picture below represents the body shape you think looks closes to your favorite body shape for a girl/boy your age?



Page 1: Which picture below represents the body shape you think most looks like you?



Page 2: Which picture below represents the body shape you think looks closes to your favorite body shape for a girl/boy your age?



VITA

Lenka Humenikova

Candidate for the Degree of

Doctor of Philosophy

Thesis: CROSS-CULTURAL COMPARISON OF FACTORS INFLUENCING BODY MASS INDEX IN CZECH AND AMERICAN SCHOOL-AGED CHILDREN

Major Field: Human Environmental Sciences (emphasis in Nutritional Sciences)

Biographical:

Personal Data: Born in Rokycany, Czech Republic, 1977 to Josef Humenik and Jitka Humenikova

Education: Graduated from Sport High School, Pilsen, Czech Republic in May 1996; received Bachelor of Science degree in Foods and Nutrition from Oklahoma State University, Stillwater, Oklahoma in May 2001. Received Master of Science in Nutritional Sciences from Oklahoma State University in December 2003. Completed the requirements for the Doctor of Philosophy at Oklahoma State University in December, 2006.

Experience: Adjunct instructor in the Department of Human Environmental Sciences at University of Central Oklahoma, Edmond, Oklahoma, Fall 2004-Spring 2005. Lecturer in the Department of Nutritional Sciences at Oklahoma State University, Stillwater, Oklahoma, Fall 2005-Spring 2006.

Professional Memberships:
American Dietetic Association
Oklahoma Dietetic Association
Society for Nutrition Education

Name: Lenka Humenikova Date of Degree: December, 2006

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: CROSS-CULTURAL COMPARISON OF FACTORS INFLUENCING BODY MASS INDEX IN CZECH AND AMERICAN SCHOOL-AGED CHILDREN

Pages in Study: 222 Candidate for the Degree of Doctor of Philosophy

Major Field: Human Environmental Sciences (emphasis in Nutritional Sciences)

Scope and Method of Study: Previous research identified numerous factors that contribute to child obesity in the U.S., including excessive intakes of energy and fat and decreased physical activity. However, there is limited understanding of the factors that influence children's dietary and exercise behaviors. Despite the low nutrient density of the traditional diet, Czech adolescents have lower BMI-for-age than American adolescents. The purpose of our study was to explore the differences in dietary intakes, physical activity, and environmental factors that influence BMI-for-age between American and Czech children. Data for this correlational study came from 97 Czech and 47 American 4-6th graders and their parents. Children's dietary intakes and physical activity were evaluated using two 24-hour recalls and the modified Self-administered Physical Activity Checklist. Height, weight, and body image perceptions of children were measured. Parenting style, parental food-related practices, availability of healthy foods, and body image perceptions were measured using the Parent Questionnaire.

Findings and Conclusions: American children consumed more energy and fat, ate fewer fruits and vegetables, and participated in less physical activity than Czech children. American children reported visiting fast food restaurants more often than Czech children. An authoritative parenting style was used more often by American than Czech parents. Czech parents were more involved in the meal preparation and made healthy foods more available at home than American parents. American children had a smaller ideal body image than Czech children. The regression model did not explain a significant portion of the variance in children's BMI-for-age. Frequent involvement of parents in food preparations, a greater availability of healthy foods, and very limited consumption of fast foods may be responsible for the higher dietary quality among Czech children. Future interventions with American families should focus on increasing parental skills related to the preparation of healthy meals and snacks, and on teaching parents how to make such foods available to their children. Further investigation of factors that contribute to children's BMI-for-age both in the U.S. and the Czech Republic should be conducted with a large sample of American and Czech children from diverse backgrounds.

ADVISER'S APPROVAL: Dr. Gail Gates, Ph.D, R.D.