



Science-Based Statement on Dietary Needs, Physical Activity Recommendations and Energy Balance for Children during Out-Of-School-Time Activities

INTRODUCTION

Healthy eating and regular physical activity are important preventive measures for reducing the risk of obesity and related diseases[1]. Out-of-school (OST) programs have been recognized for their ability to help improve youth's educational outcomes and social and emotional development, and to decrease their risk-taking behaviors. In recent years, OST environments have also been identified as promising areas for obesity prevention efforts as tens of millions of children participate in OST programs every day, with high representation of populations at risk for obesity [2]. However, there is great variability in the foods and beverages served, and opportunities for physical activity offered to children participating in out-of-school programs [3]. There is therefore a need for alignment of guiding principles across OST organizations to support healthy habits, provide greater consistency, educate and create a culture of healthful habits in the environments where children spend time out of school.

Children are encouraged to achieve energy balance as outlined in the Dietary Guidelines for Americans [4] and Physical Activity Guidelines for Americans[5]. Energy balance in children happens when the amount of ENERGY IN (calories) and ENERGY OUT ((physical activity, growth and development) support natural growth without promoting excess weight gain. There is an urgent need to improve nutrition and physical activity behaviors among children and adolescents in the US to reverse the obesity epidemic, as demonstrated by the evidence presented below on energy balance, dietary and physical activity needs, and eating and activity behaviors of children and adolescents.

Snacks consumed between lunch and dinner represent an important part of children's nutrient intake [6] and can contribute up to 25% of a child's daily energy intake[7]. Therefore snack consumption and physical activity during OST time are important considerations for achieving energy balance and for obesity

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prevention. The National Institute of Out-of-School Time (NIOST) recently developed nutrition and physical activity standards targeted at OST programs in which children spend extended periods of time (typically greater than 3 hours at a time) and where meals and snacks may be provided [8]. However there is an opportunity/need to create recommendations for other OST programs that are shorter in length than traditional afterschool programs.

Therefore *ChildObesity180* convened the leaders of nine national OST organizations to identify and implement guiding principles that are evidence-based, practical and universally adaptable, for addressing nutrition and physical activity in OST environments. This paper provides more detail about the principles followed by an overview of current research on the nutritional and physical activity needs of children, and thus the scientific basis for the three principles.

GUIDING PRINCIPLES FOR ACHIEVING ENERGY BALANCE DURING OUT-OF-SCHOOL TIME ACTIVITIES

Out of school environments are promising areas for obesity prevention efforts as tens of millions of children participate in various OST programs every day where snacks and beverages are served and where there are varying levels of physical activity.

The ***Healthy Kids Out Of School*** initiative currently focuses on three major categories of OST programs: traditional after-school programs; extra-curricular organizations; and sports leagues. *ChildObesity180* along with leaders of nine national OST organizations developed three guiding principles for addressing nutrition and physical activity in OST environments. The three guiding principles are:

- **Drink Right: Choose water instead of sugar-sweetened beverages**
- **Move More: Boost movement and physical activity in all programs**
- **Snack Smart: Fuel up on fruits and vegetables**

These principles are evidence-based, practical and universally adaptable to the needs, organizational structure, finances and culture of all types of OST organizations.

The first principle “**Drink Right: Choose water instead of sugar-sweetened beverages**” addresses the need for hydration and for reducing the consumption of added sugar, high fructose corn syrup, other caloric sweeteners, and empty calorie beverages with little or no nutritional value. Reducing consumption of

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soda and sugar-sweetened beverages will aid children and adolescents significantly in staying within the daily calorie limits outlined in the Dietary Guidelines for Americans [4].

The second principle “**Move More: Boost movement and physical activity in all programs**” addresses the need to increase energy expenditure and movement as outlined in the Physical Activity Guidelines for Americans[5]. Increasing physical activity is necessary for achieving energy balance, growth and development while reducing the risk for excessive weight gain and obesity. Increasing physical activity is also necessary for improving general health, including bone and muscle development. Increasing physical activity should also help with reducing “screen time” for children and adolescents to a level that is more in line with the recommendations of the American Academy of Pediatrics [9].

The third principle “**Snack Smart: Fuel up on fruits and vegetables**” address the need to consume at least five servings of this food category per day, based on the Dietary Guidelines for Americans[4]. Fruits and vegetables provide nutrient-rich healthy carbohydrates with high levels of fiber, vitamins, minerals and other micronutrients, and no added sugar, sodium or trans fats. Fruits and vegetables are much healthier alternatives to processed snack food such as chips and cookies, which often contain unhealthy fats, high amounts of sodium and/or added sugar, and are generally of low nutritional value. Fruits and vegetables can be fresh, frozen, dried or canned, without added sugar, caloric sweeteners or sodium.

An overview of current research on the nutritional and physical activity requirements and behaviors of children and adolescents, and thus the scientific basis for these three guiding principles is presented below.

WEIGHT STATUS IN CHILDREN

As children grow they should be in positive energy balance, taking in more calories than they expend in order to support growth and development [10]. However if energy balance becomes disproportionately positive, excess weight gain takes place leading to overweight, obesity and the resultant health risks. Since the 1970s the prevalence of childhood obesity has increased in the US at an alarming rate, more than tripling for children aged 2-19 years to a rate of more than 30% overweight or obese [11]. The potential negative impact on the nation’s health, economy, quality of life and security are tremendous [12-15].

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The obesity epidemic is likely caused by an interplay of multiple physiological, behavioral and environmental factors that influence energy intake and expenditure and thus weight status[16]. The Dietary Guidelines for Americans emphasizes consumption of fruits, vegetables, whole grains and fat-free or low-fat milk products and emphasizes limiting intake of added sugar, saturated fat, dietary cholesterol and sodium [4]. However, a large proportion of American children do not eat according to these guidelines, consuming excessive quantities of sugar and far below the recommended amount of fruits and vegetables [17-20]. Between 1971 and 2000 the calorie consumption in adolescents aged 12-19 years significantly increased [21]. Away-from-home snacking increased by 50% for young children and by over 50% for teens [22]. Consumption of sugar-sweetened beverages also increased, by 135% since 1977 [23]. Therefore over the past three decades there has been an overall significant increase in calorie consumption and a decrease in nutritional content in children's diets. At the same time, there has been an increase in sedentary time and an overall decline in total physical activity [24]. The 2008 Physical Activity Guidelines for Americans [5] states that children and adolescents (aged 6–17) should engage in 60 minutes or more of physical activity daily. Most of that time should be either moderate or vigorous aerobic activity. As part of their daily physical activity, children and adolescents should engage in vigorous activity on at least 3 days per week. In addition, they should do muscle-strengthening and bone-strengthening activities on at least 3 days per week. However one study using 2003-2004 NHANES data [25] found that less than half (42%) of children ages 6–11 years of age obtain this recommended amount of activity, and only 8% of adolescents achieve this goal. Therefore as energy intake has increased (along with a decline in nutritional content) energy expenditure has decreased, resulting in a disproportionately positive energy balance and the resultant increased prevalence of overweight and obesity for a significant proportion of American children.

DIETARY NEEDS

Calorie Requirements

Table 1: Estimated Daily Caloric Needs for Children

Gender and Age Range	Calorie Needs (kilocalories)		
	Sedentary	Moderately active	Active

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Females 4-8yrs	1200–1400	1400-1600	1400-1800
Females 9-13yrs	1400–1600	1,600–2,000	1,800–2,200
Males 4-8yrs	1200–1400	1400-1600	1600-2000
Males 9-13yrs	1600–2000	1,800–2,200	2,000–2,600

Adapted from Dietary Guidelines for Americans 2010 [4].

Table 1 lists the estimated daily caloric needs of children based on the Dietary Guidelines for Americans [4]. The number of calories required in one day depends on age, gender and activity level. Children involved in frequent, high intensity physical activities may require 200-600 more calories per day, depending on the duration and intensity level of the activity [26]. However it should be noted that according to the Dietary Guidelines for America [4] children age 6 and older should get 60 minutes or more of moderate to vigorous physical activity on most days. Therefore some children involved in high intensity physical activities may not necessarily need more calories if the activity falls within the duration outlined in the Dietary Guidelines.

Carbohydrates

Children should consume 45-65% of their energy as carbohydrates [27]. The emphasis of carbohydrate consumption should be on fruits, vegetables and whole grains.

Fruits and Vegetables

Many people think of carbohydrates as bread and rice, however some of the most important carbohydrates in our diet come from colorful fruits and vegetables. Not only do fruits and vegetables fuel the body, they are also excellent sources of vitamins A and C, phytochemicals, and fiber. Children should consume at least 5 fruits and vegetables per day [4, 26]. However 63% of children 2 to 9 years of age are not consuming the recommended servings of fruits, and 78% are not consuming the recommended servings of vegetables. Children, on average, are only consuming 2.0 fruits and 2.2 vegetables per day [28]. These low intakes are associated with inadequate intakes of vitamin A, vitamin C, and dietary fiber, in addition to high intakes of total fat and saturated fat based on foods they choose over fruits and vegetables [29]. Children should strive to consume a variety of vegetables and the majority of servings of fruit should come from whole fruit (fresh, frozen, canned or dried) rather than fruit juice [26, 30]. Increased fruit juice intake (including 100% fruit juice) is associated with excess adiposity (body fat), whereas increased consumption of whole fruits is associated with reduced adiposity [31]. This may be partly because fruit juice is

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high in calories and not as filling as whole fruit, which can lead to over consumption. The American Academy of Pediatrics recommends only 100% fruit juice and limiting intake to 4 to 6 ounces per day for children between the ages of 1 and 6. Children between the ages of 7 and 18 should consume no more than 8 to 12 ounces of 100% fruit juice per day [26, 30].

Whole Grains

Whole grains are rich in nutrients and fiber, and intake of whole grains has been inversely associated with weight gain and adiposity in children [32]. The Dietary Guidelines for Americans recommends that at least half of the grains children consume should be whole grain [4]. However US children and adolescents on average consume less than a quarter of the daily recommended amounts of whole grains [33, 34]. Most cereal grain products consumed in the US are refined and, compared to whole grain, are low in fiber and nutrients [35].

High glycemic index foods

The glycemic index or load of an individual food is a measure of how quickly it causes blood sugar levels to rise and fall. A food, snack or meal that has a relatively high glycemic index will not provide lasting energy. The fiber, protein, fat, and simple sugar content all impact the glycemic index of a food, snack or meal. Examples of high glycemic index foods include simple and refined sugars such as candy, white bread, white rice, and sugar-sweetened beverages. Children should be consuming snacks and meals that contain a relatively low glycemic load [26].

High fructose corn syrup

High fructose corn syrup is a form of corn syrup which has undergone enzymatic processing that increases its fructose content. It is comparable to table sugar (sucrose) in sweetness and is used by food manufacturers as an alternative to sucrose in soft drinks and other processed foods. Beverages and foods with high fructose corn syrup, sweets, and other sweetened foods that provide little or no nutrients should be avoided. Consumption of these foods is negatively associated with diet quality in children and can contribute to excessive energy intake [26, 30]. In addition, most of these products have a high glycemic index.

Fats

Fat is an essential dietary component and a primary fuel source for low and moderate intensity exercise. Children should obtain 25-35% of their energy from fat [4, 26, 27]. They should be consuming the majority of their fats from polyunsaturated fatty acids (omega-3 and omega-6 fatty acids) sources such

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as healthy oils, nuts and fish. Children should also consume less than 10% of calories from saturated fatty acids and keep trans fatty acid consumption as low as possible[27]. The majority of trans fats (also called “partially hydrogenated vegetable oil”) in the average American’s diet comes from processed foods and oils (~80%), while a much smaller percentage comes from trans fats that occur naturally in food from animal sources. Although on average U.S. children consume 33.5% of their calories as fat, 12.2% is in the form of saturated fat, with 3 out of 4 youths consuming excess saturated fat [36, 37]. High and unhealthy fat consumption may displace consumption of healthy carbohydrates and also contribute to excess weight gain.

Protein

Dietary protein is needed for building and repairing the body’s cells and for boosting the immune system. It is recommended that children consume between 10-30% of their calories as protein [27]. Protein does provide energy but its contribution as a fuel source is minimal (~5%) during extremely prolonged exercise, which is not common in children[38]. Protein is found in a large variety of foods such as meat, poultry, eggs, fish, dried beans, nuts and low fat dairy products. Even breads and many vegetables contain protein in smaller quantities. Fortunately, most Americans consume sufficient protein. Adequate protein intake is of concern mainly in children consuming insufficient calories and among certain sub-groups like vegetarians[39].

Micronutrients

Vitamins and minerals are essential for energy metabolism and many bodily functions. Intake recommendations vary slightly by age, gender and activity level. Children should consume foods of high nutrient quality in order to avoid micronutrient deficiencies. It is essential that children consume adequate amount of vitamins and minerals to ensure optimal growth [4, 26, 40]. Calcium, vitamin D, iron and zinc are especially important during the adolescent growth spurt and should therefore be emphasized [40]. Vegetables and fruits are excellent sources of micronutrients, including some that are consumed below recommended levels in the United States such as folate, magnesium, potassium, and vitamins A, C, and K [4].

Hydration

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Proper hydration is critical in maintaining adequate fluid balance which works to sustain normal cardiovascular and thermoregulatory functioning. Children should be encouraged to drink fluids throughout the day. The Institute of Medicine recommends that children 4 to 8 years old drink 7.5 cups of fluid per day, while 9 to 13 year olds should drink 10 cups of fluid per day [41]. It is estimated that fluid needs may increase above baseline by 2-4 cups per day for an exercising child, especially in hot and humid environments [42]. The American Academy of Pediatrics recommends **water as the best source of fluid for hydration** in all but certain specific situations, such as periods of prolonged, intense physical activity [43]. Only in such specific situations when there is a need for rapid replenishment of carbohydrates and/or electrolytes should sports drinks be consumed. Routine ingestion of sports drinks should be avoided as intake can lead to excessive calorie consumption due to their carbohydrate content [43]. The American Academy of Pediatrics also recommends that energy drinks, because of their stimulant (such as caffeine) content, are not appropriate for children and adolescents and should never be consumed [43].

The Dietary Guidelines for Americans emphasizes limiting intake of added sugar [4]. However, children and adolescents consume high amounts of added sugar, amounting to approximately 18% of their daily calorie intake [34, 44]. A major part of added sugar intake is the result of consumption of sugar-sweetened beverages such as soda and fruit juice [44, 45]. Because many foods and beverages with added sugar also contain few or no nutrients (i.e. empty calories), the Dietary Guidelines for Americans recommends severely limiting their consumption [4].

While 100% fruit juice does not contain added sugar, increased fruit juice intake is associated with excess adiposity (body fat) gains, whereas increased consumption of whole fruits is associated with reduced adiposity gains [30]. This may be because fruit juice is high in calories [45] and not as filling as whole fruit (due to loss of fiber content), which can lead to over consumption. The American Academy of Pediatrics recommends that for children ages 1 to 6, intake of 100% fruit juice should be limited to 4 to 6 ounces per day. Children between the ages of 7 and 18 should consume no more than 8 to 12 ounces of 100% fruit juice per day [26, 30].

Processed Foods and Sodium

An important dietary issue for children is the general increased consumption of processed foods, which includes fast foods and snack foods such as chips and cookies [46]. These foods are not only typically high in calories, but also often

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contain excess sodium. A staggering 68% of children are estimated to consume sodium in excess. Children between 4 and 8 years of age should consume less than 1900 mg/day of sodium and children between 9 and 13 years of age should consume less than 2200 mg/day [41]. In addition, processed foods and fast foods often contain unhealthy trans fats, are not nutrient dense and do not contribute to a healthy diet. Children should keep consumption of these types of foods to a minimum.

PHYSICAL ACTIVITY REQUIREMENTS

Daily physical activity is necessary for achieving energy balance and general health, including healthy bone and muscle development. The 2008 Physical Activity Guidelines for Americans [5] states that children and adolescents (aged 6–17) should engage in 60 minutes or more of physical activity daily. Most of that time should be either moderate or vigorous aerobic physical activity. Bouts of physical activity ten minutes or longer in duration are particularly important. As part of their daily physical activity, children and adolescents should engage in vigorous activity on at least 3 days per week. In addition, they should do muscle-strengthening and bone-strengthening activities on at least 3 days per week.

However, there has been an increase in sedentary time and an overall decline in total physical activity compared with recent decades [24]. One study using 2003-2004 NHANES data [25] found that less than half (42%) of children ages 6–11 years of age obtain this recommended amount of activity, and only 8% of adolescents achieve this. In 2009 the National Youth Risk Behavior Surveillance (YRBS) indicated that only 18% of high school students had been physically active for 60 minutes every day in the previous week [17, 34]. Several factors contribute to the decline in physical activity including a decline of participation in physical education during school [17], a reduction in organized physical activity outside of school hours [47] and a reduction in the number of children and adolescents walking or biking to school [48].

The increased use of technology in our society also presents children with an overwhelming amount of screen time opportunities which displaces physical activity. The American Academy of Pediatrics recommends no more than 2 hours of television and screen time per day for children older than two years of age [9, 34]. However television, computers and video games, most of which require little physical activity, have significant appeal to children. As a result people 8-18 years of age spend an average of over 7 hours per day on television, computers and video games [49].

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CONCLUSION

Tens of millions of children take part in OST programs every day, often involving consumption of snacks and beverages and varying levels of physical activity. By providing healthy fruits and vegetables as snacks, offering water instead of sugar-sweetened beverages and boosting physical activity, OST organizations can also play an important part in obesity prevention, education and the fostering of healthy habits that can have lifelong benefits.

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