Relationship Between Physical Activity and Overweight and Obesity in Children: Findings From the 2012 National Health and Nutrition Examination Survey National Youth Fitness Survey

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MeSH TERMS

- behavior
- motor activity
- physical fitness
- overweight
- pediatric obesity

OBJECTIVE. This study examined the relationship between childhood obesity and overweight and functional activity and its enjoyment.

METHOD. A cross-sectional design was used to analyze data from the 2012 National Health and Nutrition Examination Survey National Youth Fitness Survey. Multivariate logistic regression models were used.

RESULTS. Data for 1,640 children ages 3–15 yr were retrieved. Physical activity was negatively associated with risk of obesity (odds ratio [OR] = 0.93; 95% confidence interval [CI] [0.87, 0.98]). Although children who were obese and overweight were more likely to have functional limitations (ORs = 1.58–1.61), their enjoyment of physical activity participation was not significantly different from that of the healthy-weight group.

CONCLUSION. Physical activity lowered the risk of obesity. Children who were obese had functional limitations compared with healthy-weight children, but both groups enjoyed physical activity equally. Future studies are needed to determine barriers to participation among these children in recreation and sporting activities.

Hong, I., Coker-Bolt, P., Anderson, K. R., Lee, D., & Velozo, C. A. (2016). Relationship between physical activity and overweight and obesity in children: Findings from the 2012 National Health and Nutrition Examination Survey National Youth Fitness Survey. *American Journal of Occupational Therapy*, 70, 7005180060. <http://dx.doi.org/10.5014/ajot.2016.021212>

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In the United States, obesity is one of the most significant risk factors for physical and psychological health problems, such as metabolic disorders, Type 2 diabetes, colon cancer, cardiovascular disease, mortality, and depression (Faith, Matz, & Jorge, 2002; World Health Organization Media Centre, 2015). The estimated medical costs for obesity were \$147 billion in 2009, and obesity accounted for more than 46% of the inpatient cost increase (Finkelstein, Trogon, Cohen, & Dietz, 2009). Because it is significantly correlated with adult obesity (risk ratio = 2.27–5.91), the prevention of childhood obesity is particularly important (Brisbois, Farmer, & McCargar, 2012). Childhood obesity affects motor function, causing, for example, delays in motor development (Kantomaa et al., 2013) and a high risk of developing disabilities (De, Small, & Baur, 2008). In addition, children who are obese may face social stigmatization and discrimination (Kuczmarski, Reitz, & Pizzi, 2010; Pizzi, 2010; U.S. Department of Health and Human Services [HHS], 2010), and they may experience reduced opportunities for social participation and engaging in play at their home and school (Lane & Bundy, 2011; Pizzi & Vroman, 2013). The American Occupational Therapy Association (AOTA, 2013) reported that various occupational therapy interventions could be effective in the

area of weight management for children. Therefore, early occupational therapy interventions for childhood obesity may prevent delays in motor development and adverse psychosocial influences, as well as the range of additional health problems caused by adult obesity.

Traditionally, physical activity has been an effective prevention and treatment strategy for adult obesity (Church et al., 2011), but the recommended amount of physical activity is different for adults and children. The recommendation for adults is a minimum of 150 min/wk of moderate exercise or a minimum of 75 min/wk of vigorous exercise, but the recommendation for children is much higher: at least 60 min/day of physical activity (Physical Activity Guidelines Advisory Committee, 2008). However, although studies have proven the effectiveness of physical activity among adults with obese weight, the relationship between children's recommended physical activity and childhood obesity is still unclear (Hansen et al., 2015; Marshall, Biddle, Gorely, Cameron, & Murdey, 2004).

To better understand childhood obesity and inform interventions for children who are obese, studies on children's functional limitations, factors associated with childhood occupations, and patterns of participation is key (Lollar & Simeonsson, 2005). In addition, motivational strategies, such as student-selected activities, have been identified as an essential component of increasing physical activity for treating obesity (Salmon, Booth, Phongsavan, Murphy, & Timperio, 2007). Consistent with the use of motivational strategies, occupational therapy researchers have suggested creating individualized interventions that engage children in activities that are interesting and enjoyable (Bazyk & Winne, 2013). Therefore, determining whether a difference exists between healthy-weight and obese children in the enjoyment of physical activity is important.

Recently, the Centers for Disease Control and Prevention (CDC) released the National Health and Nutrition Examination Survey (NHANES) National Youth Fitness Survey (NNYFS), which contains various questions related to physically demanding activities for children ages 3–15 yr, including engagement in the recommended dose of physical activity (60 min/day) and participation in recreational activities (Borrud et al., 2014). The NNYFS also presents questions about level of enjoyment of physical activity and functional limitations. Using this most recent national childhood database, we investigated the relationships between childhood obesity and various personal and environmental factors. In addition, we examined the effects of childhood obesity on functional limitations. For the purposes of this study, *childhood* was defined as ages 3–15 yr.

The purpose of this study was threefold: (1) to identify risk factors for children ages 3–15 yr who are overweight or obese, (2) to identify the potential relationship between childhood obesity and functional limitations, and (3) to examine differences in the enjoyment of physical activity between healthy children and overweight and obese children. The specific research questions were (1) which factors increase or decrease the risk of childhood obesity, (2) does childhood obesity influence functional limitations, and (3) do children who are overweight or obese enjoy physical activity differently than children who are at a healthy weight?

Method

Study Design

We used a cross-sectional study design to investigate risk factors for childhood obesity and the effects of childhood obesity on functional activities and participation. Because the NNYFS does not contain any personally identifiable health information and is available as a public resource, the Medical University of South Carolina institutional review board did not consider this study human subjects research.

Study Participants

The NNYFS was conducted by the CDC in 2012 (Borrud et al., 2014). It applied a stratified multistage probability sampling design to obtain a representative sample of the civilian, noninstitutionalized resident population of the United States. The NNYFS includes data on demographics and physical activity and fitness levels of 1,640 children ages 3–15 yr who were interviewed, 1,576 of whom were examined. All data were collected through interviews of children and their parents conducted either at their home or at mobile examination centers.

Boys made up 50.2% ($n = 823$) of the sample; girls, 49.8% ($n = 817$). The average age of the participants was 9.0 yr (standard deviation [SD] = 3.7; range = 3–15 yr). Race/ethnicity was as follows: non-Hispanic White, 39.0% ($n = 639$); Hispanic, 30.2% ($n = 495$); non-Hispanic African-American, 22.7% ($n = 372$); and others, 8.1% ($n = 134$). The majority of the sample lived in a high-income household (72.3%), had parents with higher education status (56.3%), lived with married parents (64.0%), and had health insurance (95.5%).

Study Variables

Body Mass Index Category. The NNYFS categorized the sample into four groups on the basis of the CDC's sex-specific 2000 body mass index (BMI; kg/m^2)-for-age

growth charts for the United States (Kuczmarski et al., 2000): *underweight* (BMI < 5th percentile), *normal weight* (BMI 5th to <85th percentile), *overweight* (BMI 85th to <95th percentile), and *obese* (BMI ≥ 95th percentile). In this study, we categorized the underweight and normal-weight groups as “not obese” and the overweight and obese groups as “obese” for all analyses.

Demographic and Socioeconomic Variables. Children in this database were also categorized into three age groups—(1) early childhood (ages 3–5 yr), (2) middle childhood (ages 6–10 yr), and (3) adolescence (ages 11–15 yr)—because those groups have different physiological and developmental status and environmental contexts (e.g., elementary vs. high school; Lee et al., 2007, 2016). Race was categorized as non-Hispanic White, Hispanic, non-Hispanic African-American, and other. Household income was dichotomized into <\$25,000/yr and >\$25,000/yr based on 2012 poverty guidelines (HHS, 2012). Parents’ education was dichotomized into less than high school and high school graduate and higher. Parents’ marital status was dichotomized into single (widowed, divorced, separated, never married) and married. Health insurance status was dichotomized into insured and not insured.

Physical Behavior Variables. Because this was a retrospective study of national survey data, we used questions about types of activities engaged in to estimate time spent in physical activities. Children or parents were asked how many hours children sat and watched TV or used computers during the previous 30 days, how many days children had played active video games during the previous 7 days, and how many days children were physically active for at least 60 min/day (the recommended level of physical activity for children; Physical Activity Guidelines Advisory Committee, 2008) during the previous 7 days. All of these were reported as continuous variables. “Any physical activities [in the] past 7 days” was reported as a dichotomous variable (yes or no).

Functional Limitation and Participation Enjoyment Variables. Functional limitation was assessed by a survey question asking whether the child had an impairment or health problem that limited his or her ability to walk or crawl, run, or play. Responses were recorded as yes or no. For participants ages 5–15 yr, responses to “enjoyment of participation (i.e., physical education or recess)” were recorded on a 5-point rating scale ranging from 1 (*strongly agree*) to 5 (*strongly disagree*).

Statistical Analysis

Univariate analyses (descriptive statistics) were used to summarize participants’ demographic characteristics. The percentage of children in the United States who were

overweight or obese was weighted (Table 1). We performed a series of multivariate logistic regression models to estimate the adjusted odds ratios (AORs) for overweight and obese participants:

Model 1: Overweight and obese = α + demographics (sex, age, race) + ϵ

Model 2: Overweight and obese = α + demographics + socioeconomic variables + ϵ

Model 3: Overweight and obese = α + demographics + physical activity variables + ϵ

Model 4 for all variables: Overweight and obese = α + demographics + socioeconomic variables + physical activity variables + ϵ .

The model variables are listed in Table 2. When previous models had identified significant relationships, we used Model 4 to control for all study variables. A series of multivariate logistic regression models was conducted for the relationships between overweight and obesity and functional limitations (Table 3):

Model 1: Functional limitations = α + overweight and obese + ϵ

Model 2: Functional limitations = α + overweight and obese + demographics (age, sex, race) + ϵ

Model 3: Functional limitations = α + overweight and obese + demographics (age, sex, race) + socioeconomic variables + ϵ .

Statistical significance was determined at the .05 level, and results were expressed with 95% confidence intervals (CI).

To compare participation enjoyment between the healthy weight and the not-obese and obese groups, an independent *t* test or Wilcoxon rank-sum test was used, depending on the variables’ normality distributions. Statistical significance was determined at the .05 level with two-tailed tests. All analyses were performed using SAS statistical software (Version 9.4; SAS Institute, Cary, NC) for complex survey designs.

Results

Overweight and Obesity Status

The total prevalence rate of obesity in the sample was 34.6%. Boys had a higher prevalence rate of obesity (37.1%) than girls (32.0%). The adolescent group had a higher prevalence rate (38.8%) than the middle childhood (32.9%) or early childhood (30.6%) groups (Table 1).

Overweight and Obesity Risk Factors

Table 2 presents the results of the models. Model 1 controlled only for demographics, and it demonstrated that the risk of overweight and obesity was higher for

Table 1. Estimated Prevalence of the Population of Children Who Are Overweight or Obese, by Gender and Age

	Gender, % (SE)			Age, % (SE)			
	Male (<i>n</i> = 823)	Female (<i>n</i> = 817)	Total (<i>N</i> = 1,640)	Early Childhood, Age 3–5 Yr (<i>n</i> = 368)	Middle Childhood, Age 6–10 Yr (<i>n</i> = 645)	Adolescents, Age 11–15 Yr (<i>n</i> = 627)	Total (<i>N</i> = 1,640)
Weight category ^a							
Underweight	2.9 (0.6)	2.5 (0.6)	2.7 (0.3)	2.0 (0.7)	2.9 (0.6)	3.1 (0.8)	2.7 (0.3)
Normal weight	58.6 (1.9)	64.3 (2.0)	61.4 (1.8)	66.3 (2.5)	63.0 (2.7)	56.7 (2.6)	61.7 (1.7)
Overweight	17.7 (1.9)	17.9 (1.5)	17.8 (1.3)	16.2 (2.3)	15.1 (1.4)	21.4 (2.8)	17.7 (1.1)
Obese	20.8 (2.3)	15.3 (1.3)	18.1 (1.6)	15.5 (2.3)	19.0 (2.3)	18.8 (2.0)	18.0 (1.7)
Obesity group ^b							
Not obese	62.9 (1.8)	68.0 (1.8)	65.4 (1.7)	69.4 (2.5)	67.1 (2.6)	61.2 (2.5)	65.5 (1.7)
Obese	37.1 (1.8)	32.0 (1.8)	34.6 (1.7)	30.6 (2.5)	32.9 (2.6)	38.8 (2.5)	34.5 (1.7)
Weighted sample, ^c <i>N</i>	27,438,308	26,231,197	53,669,505	12,509,706	20,875,064	20,284,735	53,669,505

Note. BMI = body mass index; SE = standard error.

^aCategories were based on the Centers for Disease Control and Prevention's sex-specific 2000 BMI-for-age growth charts for the United States: underweight, BMI < 5th percentile; normal weight, BMI 5th to <85th percentile; overweight, BMI 85th to <95th percentile; obese, BMI ≥ 95th percentile. ^bNot obese = underweight + normal weight; obese = overweight + obese. ^cA stratified multistage probability sample of the noninstitutionalized population ages 3–15 yr in the United States.

boys (AOR = 1.26, 95% CI [1.09, 1.44]), adolescents (AOR = 1.47, 95% CI [1.21, 1.79]), and Hispanics (AOR = 1.37, 95% CI [1.04, 1.81]). Model 2 indicated that the risk of overweight and obesity was higher for boys (AOR = 1.19, 95% CI [1.03, 1.36]) and adolescents (AOR = 1.44, 95% CI [1.18, 1.76]), but socioeconomic variables were not related to overweight and obesity.

Model 3 demonstrated that none of the demographic variables were related to overweight and obesity, controlling for physical activity variables. In this model, the risk of overweight and obesity increased as hours per day spent watching TV or videos increased (AOR = 1.16, 95% CI [1.06, 1.26]). In contrast, physical activity of ≥60 min/day was negatively associated with the risk of overweight and obesity (AOR = 0.92, 95% CI [0.87, 0.98]). Model 4 demonstrated the AORs for overweight and obesity, controlling for all study variables. Only three variables remained significant in the final model. Hispanics were more likely to be obese (AOR = 1.36, 95% CI [1.01, 1.84]) than non-Hispanic Whites. The number of hours spent watching TV or videos was positively associated with overweight and obesity (AOR = 1.15, 95% CI [1.06, 1.26]). Last, the number of days physically active ≥60 min was negatively associated with overweight and obesity (AOR = 0.93, 95% CI [0.87, 0.98]).

Functional Limitations and Participant Enjoyment

Table 3 presents the model results for functional limitations for children who were overweight or obese. They were more likely to have functional limitations (AORs = 1.58–1.61, all *ps* < .05) in crawling, walking, running, and playing across three adjusted logistic regression models (crude OR; AOR for age, sex, and race; and AOR

for age, sex, race, and socioeconomic variables). Enjoyment of physical activity participation in the overweight and obese group (mean [*M*] = 1.69, *SD* = 0.9) was not significantly different from that in the not-obese group (*M* = 1.74, *SD* = 0.8; *p* = .21).

Discussion

This is the first study to use the NHANES NNYFS to (1) identify risk factors for overweight and obesity among children (ages 3–15 yr), (2) identify the potential relationship between childhood obesity and functional limitations, and (3) examine a difference in the enjoyment of physical activity between healthy-weight children and overweight and obese children. The study findings demonstrate that being Hispanic and having a sedentary lifestyle are associated with a higher risk of childhood obesity. Although children who were overweight and obese also had more functional limitations, enjoyment in physical activity participation of the overweight and obese group did not differ significantly from that of the healthy-weight group.

Our study findings confirmed that the 60 min/day guideline for children was negatively associated with overweight and obesity. Specifically, the risk of overweight and obesity decreased by 7% as the number of days on which participants were physically active (for 60 min) increased (AOR = 0.93, 95% CI [0.87, 0.98]). Therefore, if children who are overweight and obese follow the 60 min/day guideline, their risk of overweight and obesity may be reduced by 49%. The study findings are meaningful for childhood obesity treatment because they provide evidence supporting the 60 min/day physical activity guideline. Although the traditional physical

Table 2. Associations Between Risk Factors and Overweight and Obese Weight in the 2012 NNYFS

Variable	AOR (95% CI)			
	Model 1 (<i>n</i> = 1,640)	Model 2 (<i>n</i> = 1,566)	Model 3 (<i>n</i> = 1,380)	Model 4 (<i>n</i> = 1,319)
Gender				
Female	1.00	1.00	1.00	1.00
Male	1.26 [1.09, 1.44]*	1.19 [1.03, 1.36]*	1.25 [0.99, 1.58]	1.19 [0.94, 1.51]
Group^a				
Early childhood	1.00	1.00	1.00	1.00
Middle childhood	1.13 [0.78, 1.65]	1.14 [0.79, 1.65]	1.32 [0.86, 2.03]	1.32 [0.85, 2.06]
Adolescence	1.47 [1.21, 1.79]*	1.44 [1.18, 1.76]*	1.36 [0.88, 2.10]	1.33 [0.84, 2.10]
Race				
Non-Hispanic White	1.00	1.00	1.00	1.00
Hispanic	1.37 [1.04, 1.81]*	1.28 [0.88, 1.85]	1.31 [0.99, 1.71]	1.36 [1.01, 1.84]*
Non-Hispanic African-American	1.00 [0.71, 1.43]	0.90 [0.59, 1.36]	0.99 [0.73, 1.34]	0.95 [0.69, 1.31]
Other	0.72 [0.48, 1.08]	0.72 [0.47, 1.08]	0.68 [0.44, 1.07]	0.66 [0.41, 1.04]
Socioeconomic variables				
Annual household income ^b				
≤\$25,000		1.00		1.00
>\$25,000		0.88 [0.62, 1.25]		1.12 [0.84, 1.49]
Parent education ^c				
≤High school		1.00		1.00
>High school		0.94 [0.68, 1.31]		0.97 [0.75, 1.25]
Parent marital status				
Single		1.00		1.00
Married		0.88 [0.66, 1.18]		1.02 [0.79, 1.31]
Health insurance				
Not insured		1.00		1.00
Insured		1.17 [0.61, 2.27]		1.29 [0.74, 2.25]
Physical activity variables				
Hours watch TV or videos/day ^d			1.16 [1.06, 1.26]*	1.15 [1.06, 1.26]*
Days played active video games ^d			1.03 [0.96, 1.09]	1.04 [0.97, 1.10]
Days physically active ^{d,e}			0.92 [0.87, 0.98]*	0.93 [0.87, 0.98]*
Any physical activities past 7 days ^f				
No			1.00	1.00
Yes			0.80 [0.59, 1.09]	0.79 [0.58, 1.09]

Note. Dependent variable: obese (overweight + obese), not obese (underweight + normal). Blank cells indicate that the variable was not included in the analysis. AOR = adjusted odds ratio; CI = confidence interval; NNYFS = National Health and Nutrition Examination Survey National Youth Fitness Survey.

^aEarly childhood = ages 3–5 yr; middle childhood = ages 6–10 yr; adolescence = ages 11–15 yr. ^bU.S. Department of Health and Human Services (2012) poverty guideline. ^cHousehold education level. ^dContinuous variable. ^eDays physically active ≥60 min. ^fPhysical activities during the past 7 days, including sports, lessons, or physical education.

*Significant at $\alpha = .05$.

activity recommendation for adults (a minimum of 150 min of moderate exercise per week or a minimum of 75 min of vigorous exercise per week) had demonstrated effectiveness as prevention and treatment strategies for adult obesity (Church et al., 2011; Physical Activity Guidelines Advisory Committee, 2008), there had been no evidence to support the impact on childhood obesity of the recommended amount of physical activity for children. Although the study results were based on cross-sectional data, this information will be useful for future randomized controlled trials. In addition, health care practitioners can use this recommended physical activity guideline (≥60 min/day of physical activity participation) to educate children who are overweight and obese and

their parents, as well as to establish overweight and obesity prevention strategies in clinical settings or schools (Dwyer, Baur, Higgs, & Hardy, 2009).

It is interesting that our findings showed no difference in enjoyment of physical activities between the overweight and obese group and the not-obese group. In significant majorities, both groups answered “strongly agree” or “agree” to a question about whether they enjoyed participation in activities ($p = .21$). This finding may indicate that the level of motivation for participating in physical activities is similar regardless of body weight. Enjoyment of physical activity or motivation for participating in physical activities is important in establishing treatment strategies (Salmon et al., 2007). Children

Table 3. Risk of Functional Limits of Overweight and Obesity

Functional Limits ^a	AOR (95% CI)		
	Model 1 ^b	Model 2 ^c	Model 3 ^d
Not obese	1.00	1.00	1.00
Overweight and obese	1.58 [1.08, 2.32]*	1.58 [1.10, 2.28]*	1.61 [1.02, 2.54]*

Note. AOR = adjusted odds ratio; CI = confidence interval; not obese = underweight + normal.

^aActivity limitations in crawling, walking, running, and playing. ^bCrude odds ratio. ^cAdjusted for age, sex, and race. ^dAdjusted for age, sex, race, household income, parents' education, parents' marital status, and health insurance.

*Significant at $\alpha = .05$.

who are overweight or obese are more likely to have anxiety or depression and lower self-esteem than children of healthy weight (Faith et al., 2002; Franklin, Denyer, Steinbeck, Caterson, & Hill, 2006; Sjöberg, Nilsson, & Leppert, 2005). Pizzi and Vroman (2013) reported that the mental health issues affected by obesity can also lead to reduced social participation and physical activity as well as increased dysfunctional patterns of eating (i.e., binge eating). For children who are overweight and obese, the enjoyment from participating in physical activity may provide an entry point for interventions that can interrupt the vicious cycle of overweight patterns. Enjoyment of physical activity was not different between the overweight and obese group and the healthy-weight group; thus, health care practitioners may be able to find ways to use physical activities as a weight control treatment for these children.

Overweight and obesity were positively associated with functional limitations in crawling, walking, running, and playing (AORs = 1.58–1.61, all $ps < .05$). These motor skills are essential when children explore and participate in different occupations; therefore, functional limitations could restrict participation in activities that require strong physical movement (AOTA, 2008). Although the proxy variables (i.e., socioeconomic variables) were not significant risk factors for overweight and obesity in this study, the functional limitations among the overweight and obese group could be a function of limited access to playgrounds or physical activity facilities and safe neighborhoods (Bethell, Simpson, Stumbo, Carle, & Gombojav, 2010; Sallis et al., 2009; Ziviani, Scott, & Wadley, 2004). Cahill and Suarez-Balcazar (2009) reported that cultural and environmental factors can limit the opportunities to access fresh and nutritious foods, thereby increasing childhood obesity. It is also possible that adolescents are conscious of peers' attitudes toward and perceptions of their performance, which may limit their actual participation in physical activities (Pizzi & Vroman, 2013). For example, children who are over-

weight or obese are more likely to be teased by peers, resulting in both less physical activity participation and fewer friends than healthy-weight children (Sjöberg et al., 2005; Walker & Hill, 2009).

The prevalence of overweight and obesity among children ages 3–15 yr was 34.6% in 2012—2.8% higher than that among children ages 2–19 yr in the NHANES 2009–2010 survey (31.8%; Ogden, Carroll, Kit, & Flegal, 2012). The trend of overweight and obesity among girls ages 2–19 yr was stable between 2003 and 2008, and the prevalence actually decreased to 30.4% between 2008 and 2010 (Ogden et al., 2012). However, analysis of the current survey reveals a higher prevalence of overweight and obesity—32.0% among girls ages 3–15 yr in 2012. This finding may indicate an increasing trend of overweight and obesity among girls. Because identifying the prevalence of childhood obesity is necessary to address current obesity issues, these results can be used for obesity-related health care policy and in clinical settings.

This study showed that a higher risk of overweight and obesity is associated with level of participation in physical activity and is less influenced by gender differences. Previous studies have reported that boys are more vulnerable to overweight and obesity than girls (Meigen et al., 2008), an observation partially supported by the different prevalence of overweight and obesity among boys and girls in our study. However, when controlling demographic, socioeconomic, and physical activity variables in the final regression model (Table 2, Model 4), the risk of overweight and obesity between boys and girls was not significantly different (AOR = 1.19, 95% CI [0.94, 1.51]). When controlling physical activity variables in the final regression model (Table 2), gender was not a significant risk factor for overweight and obesity, perhaps because boys were more likely to participate in physical activities than girls (AOR = 1.81, 95% CI [1.32, 2.48]) and, therefore, physical activity variables carried more variance than gender variables when controlling physical activity variables in the regression model.

Limitations and Future Research

This study has several limitations. First, with the exception of body measures, the primary outcome measures were children's responses to survey questions. Those questions may have been less objective as a result of several factors, such as recall bias, misunderstanding of questions, or giving socially desirable responses. Second, nutrition factors and medical condition information were not available in the NNYFS dataset. Future studies would

need to verify the effectiveness of the recommended level of physical activity for children who are overweight or obese using a prospective research design and also identify the relationships among nutrition, medical condition, and childhood obesity. In addition, future studies would need to validate the impact of enjoying physical activity for children who are overweight or obese.

Implications for Occupational Therapy Practice

Several studies have shown that childhood obesity has a negative impact on children ages 3–15 yr (Brisbois et al., 2012; De et al., 2008; Kantomaa et al., 2013; Lane & Bundy, 2011). The findings of this research study confirm these earlier findings and have further important implications for occupational therapy practice:

- Health care practitioners should promote the recommended level of 60 min of daily physical activity as an obesity prevention strategy.
- In this study, the reported level of enjoyment in physical activity was statistically the same, regardless of weight status. Therefore, health care practitioners should consider internal and external factors that may interfere with participation in physical activity among children who are overweight or obese. These factors may include lack of access to play, recreational, or sporting activities or decreased motor skill abilities needed to successfully participate in physical activities.
- The finding that overweight or obese children have the same level of enjoyment in participation as healthy-weight children shows that these children are likely to engage in physical and recreational activities if the right support is provided to deal with internal and external barriers. Health care practitioners need to examine the psychosocial, physical, and environmental factors that may be barriers to participation and provide the necessary supports to overcome such barriers. ▲

Acknowledgment

We thank the Centers for Disease Control and Prevention for providing the study data (<http://www.cdc.gov/nchs/nnyfs.htm>).

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