Relating activity involvements to child weight status: Do normal and overweight children differ in how they spend their time?

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Abstract

The prevalence of obesity in American youth has reached alarming levels. The proportion of overweight children, defined as Body-Mass-Index (BMI) exceeding the 95th percentile for age and sex based norms, has tripled in the past three decades (Troiano & Flegal, 1998). It is assumed that obese and non-obese children spend their time in different ways. Yet, few studies have examined how normal weight and overweight children differ (or do not differ) in the ways they spend their time. In this paper, we draw upon the Child Development Supplement (CDS) to the Panel Study of Income Dynamics (PSID) which collects 24h time diaries from children to examine similarities and differences in which normal weight and overweight children spend their time. Results indicate that time spent sleeping, playing organized sports, and using the computer (non-game) on weekdays are related to decreased odds of childhood/adolescent overweight status, while time playing electronic games on weekdays and napping on weekends are associated with increased odds of overweight. Overweight children spend more time with parents and siblings.

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Do normal and overweight children differ in how they spend their time?

The prevalence of obesity in American youth has reached alarming levels. The proportion of overweight children and adolescents, defined as a Body-Mass-Index (BMI) exceeding the 95th percentile for age and sex based norms, has tripled in the past three decades (Troiano & Flegal, 1998). Current estimates indicate that approximately 10% of 2-5 year-olds and 15% of 6-19 year-olds are overweight (Ogden, Carroll, Curtin, McDowell, Tabak & Flegal, 2006).

The increased prevalence of overweight and obese youth has placed an unprecedented burden on children's health. Overweight and obese children are at an increased risk of suffering comorbidities including type 2 diabetes, hypertension, dyslipidemia and hyperinsulinemia, fatty liver disease and orthopedic disorders (Lobstein, Baur, & Uauy, 2005). Almost two-thirds (60%) of overweight children have at least one cardiovascular risk factor (e.g., hypertension, hyperlipidemia) (Freedman, Dietz, Srinivasan, & Berenson, 1999). Moreover, though overall prevalence rates are still low, the number of youth with some degree of glycemic abnormalities (precursors to type 2 diabetes mellitus) is on the rise, and closely parallels the trend in increasing weight status of youth globally (Bloomgarden, 2004). It has been estimated that obesity-related morbidity accounts for approximately 6% of national health expenditure in the U.S (Wolf & Colditz, 1998). Thus, the striking increase in the prevalence of childhood obesity seen in the last three decades will dramatically affect public health expenses, programs and priorities well into the 21st century.

It is generally assumed that obese and non-obese children spend their time in very different ways. Yet, despite a plethora of research focusing on childhood obesity, few studies have examined the ways in which normal weight and overweight children

differ (or do not differ) in the ways they spend their time on a daily basis. What research there is on this question tends to focus on either physical activity level, or single sedentary activities, particularly time spent television viewing. This however, does not provide us with a holistic view of the child and the ways in which they spend their time. Part of the reason for this research gap is that few existing studies collect full 24h time-use diaries from children necessary to get a full picture of the ways in which children spend their time. In fact, the only existing study which collects 24h time diaries from children in the context of other measures (such as Body-Mass-Index), is the Child Development Supplement (CDS) to the Panel Study of Income Dynamics (PSID). In this paper, we draw upon this unique and rich data set to examine the similarities and differences in the ways in which normal weight and overweight children spend their time.

Based upon previous research, we examine differences between children of normal weight, children at-risk for overweight, and children who are overweight in the following activities: Sleeping (including night sleeping and napping); Media Use (TV viewing, electronic game play, and non-game computer use); Active play (including organized sports, and unstructured outdoor play); and Social Interactions (time alone, with friends, with parents, and with siblings). Each of these activities is either assumed to be different, or have been found to differ in children according to their weight status.

Sleeping

Recent research implicates time spent sleeping as an important predictor of weight status. Duration of sleep has been shown to be related to both adult and child BMI status. Cizza (2005) found a U-shaped curve for the relationship between sleep and BMI: adults with fewer and more than 7-8 hours of sleep/day had higher levels of BMI than those getting 7-8 hours. Studies of children's sleeping duration have found a strong association between BMI and sleep duration for boys. A Canadian cross-sectional study found an inverse association between sleep duration and risk for

overweight/obesity for boys, but not girls age 5-10 years (Chaput, Brunet, & Tremblay, 2006). Sleeping less than 12-13 hours/day for this age group increased the risk of overweight/obesity. Children who slept 10.5-11.5 hours/day had a 42% increased risk, while those who slept only 8-10 hours/day had a 245% increased risk. An Australian study of children age 7-15 also found an inverse relationship between sleep duration and overweight for boys (Eisenmann, Ekkekakis, & Holmes, 2006). This relationship was not found for girls. There was a 1.6 – 1.8 increase in odds of overweight for those boys sleeping 8-9 or 9-10 hours. For those sleeping less than 8 hours, the odds of overweight were 3.1 times greater than those sleeping more than 10 hours.

Further, longitudinal studies show a positive association between short duration of sleep and weight gain (Reilly, Armstrong, Dorosty, Emmett, Ness, Rogers, et al., 2005). It has been found that sleep is important for the regulation of metabolic hormones. Restricting sleep raises levels of ghrelin, which stimulates hunger, and lowers levels of leptin, which suppresses hunger and increases appetite for high-carbohydrate foods (Spiegel et al., 2004). Sivak (2006) suggests the relationship of sleep duration and overweight/obesity may not only be due to these hormones, but also to the amount of food consumed because being awake simply allows more time to eat. Murdey, Cameron, Biddle, Marshall and Gorely (2004) have also found that reduced sleep is a factor associated with increases in sedentary behavior. In this study, we examine both night sleeping and day time napping.

Media Use

Youth of all ages spend a fair proportion of their time using electronic media (3-5 hours a day watching television, for example), more time than in any other single free-time activity except for sleep (Huston, Wright, Marquis & Green, 1999; Wright et al., 2001). Partly because of this, the notion that media use (particularly television) bears much of the responsibility for the increased prevalence of obesity in American youth is

dearly held by the lay public and scholars alike (Chen & Kennedy, 2001; Dietz, 2001; Dietz & Gortmaker, 1985; Gortmaker, Dietz, Sobol & Wehler, 1987; Gortmaker, et al, 1993). Moreover, this conviction has begun to shape prominent public health policies. For the first time, the U.S. Dept. of Health and Human Services has listed the reduction of television viewing as a national health objective in *Healthy People 2010*. Likewise, the American Academy of Pediatrics (AAP) recently published a policy statement regarding the prevention of pediatric overweight and obesity in which they identify limiting television and videogame use to no more than 2 hours per day as an important strategy for preventing obesity among children and adolescents (AAP, 2006).

However, empirical evidence for this belief is mixed at best. Some researchers find a positive relationship between media use and childhood obesity (Dietz & Gortmaker, 1985; Hancox & Poulton, 2006; Kautiainen, Koivusilta, Lintonen, Virtanen & Rimpel, 2005; Tremblay & Whims, 2003); but others report no relationship (McMurray et al, 2000; Vandewater, Shim & Caplovitz, 2004; Wake, Hesketh & Waters, 2003).

Thus, despite high levels of media use and a high incidence of obesity among youth, evidence that these concurrent trends are strongly related is equivocal (Davison, Marshall & Birch, 2006). In a recent meta analysis, Marshall, Biddle, Gorely, Cameron and Murdey (2004) found that the associations between media use and obesity among youth, though consistently positive, are extremely weak, and concluded that they are of little clinical relevance. However, they note that important contextual factors and confounders are rarely accounted for in the extant literature. In this study, we examine the relationship between children's weight status and TV viewing, electronic game play and non-game computer use. The richness of the CDS data allows for control of a number of important contextual factors.

Active Play

It is generally assumed that a major factor in the increase in rates of obesity in children and adolescents is due to decreased physical activity levels. Empirically, this notion has been supported. For example, Gillis, Kennedy, and Bar-Or (2006) found a negative correlation between obesity and total amount of physical activity. Interestingly however, the overweight perceived themselves to be just as active as their non-obese counter parts. Rates of physical activity decline and sedentary behaviors increase with increasing age after early adolescence (Kristjansdottir & Vilhjalmsson, 2001). Specifically, girls are less active than boys regardless of being overweight or not (Gillis, Kennedy, & Bar-Or, 2006). One of the reasons girls may be less physically active than boys is due to their lower enrollment in and higher withdrawal rate from organized sport clubs (Vilhjalmsson & Kristjansdottir, 2002). In this study, we focus on two types of activities thought to differ for children by weight status, organized sports and unstructured outdoor play.

Social Interaction

There is a fairly large body of literature documenting the fact that overweight adolescents are more socially isolated (Strauss & Pollack, 2003) and experience more weight-based teasing and stigmatization (Latner & Stunkard, 2003 ; Pearce, Boergers & Prinstein, 2002). Body weight is related to lower self esteem and weaker peer relations for adolescent girls (O'Dea, 2006), and dating was found to be less likely for adolescent boys and girls that were overweight than for normal weight adolescents (Cawley, Joyner, & Sobal, 2006). Some have speculated that overeating in obese children may result from self-stimulatory behavior that is a consequence of environmental and socio-emotional deprivation (Christoffel & Forsyth, 1989). Lissau and Sorenson (1994) documented a nine fold increased risk of obesity among children who were neglected. Based upon this evidence, we examined differences in time spent alone, time spent

interacting with friends, time spent interacting with siblings and time spent interacting with parents.

Method

Sample

Data for this study come from the Panel Study of Income Dynamics (PSID) Child Development Supplement (CDS). The PSID is a longitudinal study of a representative sample of U.S. individuals and their families. It focuses on the transfer of capital within families. The CDS represents and expansion of the PSID and provides comprehensive information on parents and children's education, health, cognitive and behavioral development within the context of family, neighborhood, and social environment (See http://psidonline.isr.umich.edu for further detail regarding measures and procedures). Appropriately weighted, these data provide nationally representative estimates.

The current study uses a sub-sample of the CDS (*n* = 1,270) collected in 2002-2003 when the children were ages 9-18. We focus on youth who have completed two time-use diaries (a weekday and a weekend). The resulting sample includes 633 boys and 636 girls. The median income of families is $67,920, with 8% of families falling below the poverty line. Ten percent of the parents had not graduated high-school, 33% had a high-school diploma, 24% had some college, and 34% had attained a bachelors degree or higher. Eighty percent were European American and 20% were African American.

Measures

Child Body-Mass-Index (BMI). Weight and height information was collected via strain gauge lithium bath scales (Measurement Specialties Inc., 2005) and measurement tape, respectively, during the home interview. Children were measured in stocking feet, and, in the case of weight, in light clothing and with pockets emptied. BMI was calculated from height and weight by employing the formula from the National Center for Chronic Disease Prevention and Health Promotion (Weight [lbs] ÷ Stature [in] ÷ Stature [in] X

703). Because BMI varies by age and sex, BMI was converted to a BMI z-score using the Centers for Disease Control's BMI growth reference to determine an age- and sex-specific BMI z-score for subjects ages 2 to 20 years (Ogden, Flegal, Carroll, and Johnson, 2002). The definition of overweight among children is a statistical definition based on the 2000 Centers for Disease Control and Prevention (CDC) growth reference for the United States (Ogden, Flegal, Carroll, and Johnson, 2002; Himes,1999). Overweight (also called obese) is defined as at or above the 95th percentile of BMI-for-age. At risk of overweight (also called overweight) is defined as at or above the 85th percentile, but less than the 95th percentile, of BMI-for-age. The BMI-for-age growth charts were developed from 5 national data sets (NHES 2, NHES 3, NHANES I, NHANES II; and NHANES III for children < 6 years).

Sixty-seven percent of the sample were normal weight, 13 % were at risk of overweight, and 20 % were overweight/obese. For boys, sixty-one percent of the sample were normal weight, 15% were at risk for overweight, and 24% were overweight. For girls, 68% were normal weight, 16% were at risk, and 17% were overweight.

Children's Time in Activities. Children's time use information was collected from 24 h time-use diaries on one randomly chosen weekday and one randomly chosen weekend day. All time use variables utilized here were constructed by summing the minutes spent in each respective activity as either primary or secondary on a weekday and on a weekend day independently. For multinomial logistic regression, the sum was divided by 60 to express time in hours, that is, to interpret odds ratios by the unit of an hour. We focus on activity involvements generally thought to differ among normal weight, at risk, and overweight children. These include:

- Sleeping: time spent sleeping during the night, time spent napping

- Media Use: time spent watching television, time spent playing electronic games, time spent in non-game computer use
- Active play: time spent in organized sports, time spent in unorganized outdoor play

All of the activity variables were created by summing time spent in various activities across the 24h period for weekday days and weekend days, respectively. Weekdays and weekends are examined separately because it is known that both children and adults spend their time very differently on the weekdays versus the weekends (Juster & Stafford, 1981). *Time spent sleeping* includes night time sleeping only. *Time spent napping* includes naps and resting, dozing, and laying down. All *media use* variables were created by summing total time using each of the various media. As for play activities, o*rganized sports* include lessons for sports and active leisure, organized meets, games, and practices for team based and individual sports. U*nstructured outdoor play* includes unorganized active leisure, sports, and exercise (e.g., soccer, kickball, basketball, swimming, karate), and active activities such as playing catch, walking for pleasure, hiking, fishing, camping and general playground activities).

Children's Social Interaction. In the 24-hour time-use diaries, who was participating directly with the child during the activities was also reported. To determine if children's social time differed among normal, at risk, and overweight children, we measured time alone, time with friends, time with parents, and time with siblings. *Time alone* was calculated by summing all the minutes spent in all activities in which nobody participated with the child. The sum was divided by 60 to express time in hours. *Time with friends* represents the amount of time spent in all activities in which friends participated. *Time with parents* includes time spent in all activities in which one or both

parents were involved. *Time with siblings* represents the amount of time in all the activities in which a child's brother, sister, step-brother, or step-sister participated.

Covariates. Socio-demographic characteristics and time in school or daycare were treated as covariates in the analyses. Socio-demographic variables included: *family income to needs ratio*, that is, proportion of the family's income by the poverty threshold for the family; *parent education* measured by the number of years of education the head of the household completed; *child age*; and *child ethnicity*. Because time spent in school limits the amount of children's discretionary time, we also controlled for *time in school or daycare* for analyses of weekday time use.

Child Maturational status was also controlled because maturation-related misclassification may result in overestimations of overweight prevalence rates among early maturing adolescents and underestimations among later maturing adolescents (Himes, 1999; Wang, 2002) This was assessed utilizing the Khamis-Roche (KR) method for predicting % of adult stature (Khamis & Roche, 1994) Percent of adult stature has been shown to be significantly correlated with maturational status (range r = .50 to .70) and thus a good proxy for maturational status when other, more invasive measures, are not available (Beunen, et al., 1997; Himes, et al., 2004; Roche, et al., 1983). It is calculated using current stature (in) current weight (lb) and mid-parent stature (in) where mid-parent stature represents the average height of both parents. The regression equation for predicting adult stature takes the form: predicted adult stature $= \beta_0 + \beta_1$ stature $+ \beta_2$ weight $+ \beta_3$ mid-parent stature, where β_1, β_2, and β_3 are the coefficients by which stature, weight, and mid-parent stature, respectively, should be multiplied. Percent of adult stature at a given age is then predicted by adult stature / current stature.

Analysis Plan

Multinomial logistic regressions were conducted predicting child weight status based on children's daily activities and their social interaction separately. Day-types

(weekday vs. weekend day) were analyzed separately, because the structure of children's time, particularly their discretionary time, differs on weekdays and weekends. Four models were performed: 1) a model to predict child weight status based on children's daily activities during weekdays; 2) a model based on children's time use in social interaction during weekdays; 3) a model based on children's daily activities during weekends; and 4) a model based on children's time use in social interaction during weekends.

Because the relations between children's time use and their BMI are known to vary by gender and age (Vandewater & Huang, 2006), we additionally analyzed the interaction effects of gender and age separately with children's activities and social interaction. Stata 8.0 was used for all of the analyses. Because of the existence of sibling pairs in the CDS data, standard errors were corrected for non-independence.

Results

Table 1 displays means and standard deviations of covariates and time use variables. Results of multinomial logistic regression models predicting child weight status based on children's sleeping, media use, and active play are presented in Table 2. Results predicting child weight status from social interaction variables (time alone, time with friends, time with parents, and time with siblings) are presented in Table 3. The odds ratios shown in Table 2 and Table 3 represent the odds of a child being either at risk for overweight (compared with children of normal weight) or overweight (compared with children of normal weight). Odds ratios of 1.0 represent exactly even odds. Odds ratios above 1.0 indicate increased odds, and odds ratios below 1.0 indicate decreased odds by the unit of an hour.

Sleeping

Time spent sleeping at night on weekdays was related to decreased odds for both being at risk for overweight and child overweight compared to normal weight. That

is, sleeping less increased the odds of being in a higher weight status group. Upon further analysis by gender, this was true only for girls. Time spent napping on weekends was associated with increased odds of both being at risk for overweight and overweight. Sleeping on weekends and napping on weekdays were unrelated to child weight status.

Media use

Time spent viewing television was not related to child weight status. However, there was a significant interaction between age and television viewing on weekdays. For older children in our sample (ages 13 and older), time spent viewing television was related to increased odds of being at risk for overweight (odds ratio: 1.17(1.01-1.36)). This means the odds of an older child being at risk for overweight increases 17% for every additional hour of television viewing. Time spent playing electronic games on weekdays was related to increased odds of being at risk for overweight compared to normal weight. Upon further analysis by gender, this was true only for boys. For boys, time spent playing electronic games increased the odds of being at risk for overweight by 43% (odds ratio: 1.43(1.16-1.75)).

Interestingly, non-game computer use was associated with decreased odds of being at risk for overweight: a 26% decrease on weekdays and a 20% decrease on weekends. The interaction of gender and non-game computer use on weekends presented that only for boys, time spent in non-game computer use was related to decreased odds of overweight (odds ratio: 0.55 (0.35-0.85)). This means the odds of a boy being overweight decreases 45% with the increase of one hour in computer use including email, instant messaging, use for homework, etc. Sedentary activities such as media use are assumed to have positive relations with children's obesity. According to our findings, this was true for older children's television viewing and for boys' electronic games on weekdays. Non-game computer use had negative relations with children's overweight.

Active play

On weekdays, time spent participating in organized sports was related to decreased odds of being both at risk for overweight and overweight compared to normal weight (53% decrease; 24% decrease, respectively). A significant relationship between unstructured outdoor play and weight status was not found. However, the interaction of gender and time in unstructured outdoor play on weekdays showed that only for girls, time in unstructured outdoor play was related to decreased odds of being at risk for overweight (odd ratio: 0.59(0.36-0.96)). Organized sports and unstructured outdoor play occurring on weekends were not associated with child obesity. We also did not find interaction effects for gender and age.

Social interaction

Socially isolated time (time alone) and social time with friends were not related to child weight status. We found significant relations between time with siblings and at risk for overweight, and between time with parents and overweight, on weekdays. This may suggest that interacting within family boundaries is related to increased odds of obesity.

Discussion

The goal of this study was to examine if overweight and normal weight youth spend their time in very different ways. Activity factors of interest included sleep (both nighttime and napping); media use (television viewing, electronic game use, non-game computer use); active play (organized sports and unorganized outdoor play); and social interaction (time alone, with friends, with parents, and with siblings). Interactions of gender and age were also assessed. Overall, we found evidence of important differences and similarities in the ways time is spent by children and adolescents according to their weight status.

Sleep. As Chaput, Brunet, and Tremblay (2006) and Eisenmann, Ekkekakis, and Holmes (2006) found in their respective studies, both at risk and overweight

adolescents slept less during the week and on weekends compared to normal weight adolescents. However, a significant relationship was found only for girls, which conflicts with the findings of the previous studies. Thus, a reduction in 1 hour of sleep on a weekday increases the odds of being at risk or overweight by 12%. At risk and overweight children napped more on the weekends than normal weight children. This may be a means of catching up on missed sleep during the week. However, napping 1 hour on the weekend increases the odds of being at risk and overweight by 28% and 24% respectively. Because this study is cross-sectional, however, we can not conclude that sleep deprivation leads to increases in weight gain, but rather that sleep deprivation and higher weight status are associated. Sivak (2006) suggests the relationship of sleep duration and overweight/obesity may be due to amount of food consumed as being awake allows more time in the day to eat. Murdey, Cameron, Biddle, Marshall and Gorely (2004) also suggest that reduced sleep is associated with increases in sedentary behavior. Feeling tired may make one reluctant to engage in more active activities. These notions however, can not be tested directly in this study and warrant further research.

Media use. Findings on television viewing and weight status are mixed (Davison, Marshall & Birch, 2006), with some studies finding a positive relationship (Dietz & Gortmaker, 1985; Hancox & Poulton, 2006; Kautiainen, Koivusilta, Lintonen, Virtanen & Rimpel, 2005; Tremblay, 2003) and others finding no relationship (McMurray et al, 2000; Vandewater, Shim & Caplovitz, 2004; Wake, Hesketh & Waters, 2003). Our study found a significant relationship between television viewing and BMI only for older children. Older children with higher weight status spent more time watching television than normal weight children. Electronic game play was also associated with higher BMI status. Playing electronic games for 1 hr on a weekday increases the odds of being at risk for overweight by 23%. For boys, this increase in electronic game play increases

the odds for those at risk for overweight by 43%. Children and adolescents at risk for and overweight, however, spent less time on non-game computer use. This may suggest that there is an association between weight status and choice of media activities which are more socially isolating. Non-game computer use, for example, includes email and instant messaging, which the at risk and overweight adolescents are spending less time doing during the week.

Active play. At risk and overweight children and adolescents spent less time in organized sports than normal weight children. A 1 hour reduction in time spent in organized sports is associated with a 53% and 24% increase in at risk for overweight and overweight respectively. In addition, girls of higher BMI status spent less time in unorganized outdoor play during the weekdays. This is in agreement with Gillis, Kennedy, and Bar-Or (2006) who found that girls were less active than boys. This suggests that children and adolescents of higher weight status, especially girls, are spending less time in activities that are likely to expend higher amounts of energy than more sedentary activities such as television viewing or electronic game use. This may also suggest, once again, a preference for activities that are more socially restrictive.

Social Interaction

Contrary to Strauss and Rollack (2003) who state that overweight adolescents are more socially isolated, our direct measure of time spent alone or with others shows few differences in the amount of time spent with other people. Children and adolescents of higher weight status do, however, spend significantly more time with their families (both parents and siblings), than normal weight children do. Available measures however do not allow us to determine the size of social groups of the various BMI status adolescents. Thus, although there are no significant differences in the amount of time spent with friends, there may be differences in the number of friends present for any

given activity. Spending more time with their parents and siblings may reflect family patterns in activity choices.

A limitation of this study is that it is cross-sectional in nature, thus we can not say with any certainty that participation or lack thereof in the activities assessed cause weight gain. We can only show that there is a pattern of activities that at risk for overweight and overweight children do that tend to be sedentary and potentially socially isolating. However, we do not know if that comes as a result of being overweight or if it leads to being overweight. Another limitation is that the time dairies are based on self report data. Thus, youth (or their parents who may have helped in the reporting) may want to paint a 'better' picture of what they/their children do in a given day, leading to conservative estimates of time spent in activities that may be associated with being heavy (e.g. television viewing).

Conclusion

The aim of this study was to assess the extent to which children and adolescents at risk for overweight and overweight spend their time differently than those of normal weight. We rely on 24-h time diaries, which provide a full accounting of all time spent by youth on one weekday and one weekend day. Findings suggest that time spent sleeping and playing organized sports are related to decreased odds of overweight, while playing electronic games, particularly for boys, is associated with increased odds of overweight. Though there was no main effect for television viewing and weight status, there was an interaction between television viewing and age, such that for older children, time spent viewing television was related to being at risk for overweight. Further examination is needed to identify other factors, beyond age and gender, that may moderate the relations of time use and obesity. Additionally, time of day of activities may be an important area for future research, as it relates to how children spend discretionary versus non-discretionary time.

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Table 1. Mean and Standard Deviation of all variables of interest

	M	SD		
Income to needs ratio	4.76	6.16		
Parental education	13.67	2.28		
Ethnicity[a]	0.84	2.75		
Age	13.91	2.75		
Gender[b]	0.50	0.50		
Maturation status	90.03	8.90		
Time[c] in school	366.02	184.70		
	Weekday		Weekend	
Time[c]	M	SD	M	SD
sleeping (night)	526.77	98.00	607.97	132.69
napping	11.94	47.46	14.77	48.82
viewing TV	130.49	46.82	197.51	152.22
electronic games	30.31	62.97	50.47	91.37
non-game computer use	22.55	55.83	28.65	79.34
organized sports	18.60	48.77	13.47	51.71
unstructured outdoor play	19.52	51.91	45.86	87.67
Time[d]				
alone	163.28	134.32	185.75	172.47
with friends	88.74	137.02	162.47	212.10
with parents	133.64	127.72	247.03	203.15
with siblings	112.40	131.00	225.95	233.65

[a] white = 0; others = 1
[b] boys = 0; girls = 1
[c] minutes spent in each activity
[d] minutes spent with whom

Table 2. Multinomial Logistic Regression Model Predicting Child Weight Status From Time (Hours) spent in activities

	Weekday	Weekend
	Child at risk for overweight compared with child of normal weight	
Sleeping	0.88 (0.78-1.00)*	0.98 (0.90-1.07)
Napping	1.18 (0.99-1.41)	1.28 (1.04-1.57)*
TV Viewing	1.08 (0.96-1.21)	1.00 (0.92-1.08)
Electronic games	1.23 (1.03-1.46)*	1.00 (0.87-1.14)
Computer (non-game)	0.74 (0.55-0.99)*	0.80 (0.65-1.00)*
Organized sports	0.47 (0.32-0.68)***	0.94 (0.75-1.19)
Unstructured play	0.95 (0.74-1.21)	0.86 (0.73-1.01)
	Child overweight compared with child of normal weight	
Sleeping	0.88 (0.78-0.99)*	0.92 (0.85-1.00)
Napping	1.04 (0.83-1.29)	1.24 (1.02-1.52)*
TV Viewing	1.03 (0.94-1.13)	1.07 (0.98-1.15)
Electronic games	0.98 (0.81-1.19)	1.02 (0.91-1.16)
Computer (non-game)	0.81 (0.56-1.16)	0.96 (0.69-1.33)
Organized sports	0.76 (0.58-1.16)*	0.90 (0.71-1.14)
Unstructured play	0.94 (0.71-1.23)	1.13 (1.00-1.29)

Values are expressed as odds ratios (95% confidence interval). All of the values control for family income to needs ratio, education of household head, child race (White=0; African American=1), child age, child gender (Boys=0; Girls=1), and child maturational status on both the weekday model and the weekend model, and time in school on the weekday model.
* p<.05; *** p<.001

Table 3. Multinomial Logistic Regression Model Predicting Child Weight Status From Time (hours) spent in social interaction

	Weekday	Weekend
	Child at risk for overweight compared with child of normal weight	
Time alone	1.04 (0.93-1.16)	1.05 (0.96-1.14)
Time with friends	0.99 (0.90-1.09)	1.02 (0.95-1.10)
Time with parents	1.10 (0.98-1.24)	1.07 (0.99-1.15)
Time with siblings	1.13 (1.02-1.26)*	1.03 (0.96-1.09)
	Child overweight compared with child of normal weight	
Time alone	1.05 (0.95-1.17)	1.02 (0.93-1.11)
Time with friends	0.96 (0.86-1.07)	0.96 (0.90-1.03)
Time with parents	1.11 (1.01-1.22)*	0.98 (0.91-1.04)
Time with siblings	1.02 (0.93-1.13)	1.00 (0.94-1.06)

Values are expressed as odds ratios (95% confidence interval). All of the values control for family income to needs ratio, education of household head, child race (White=0; African American=1), child age, child gender (Boys=0; Girls=1), and child maturational status on both the weekday model and the weekend model, and time in school on the weekday model.
* $p<.05$