

# Influence of Limit-Setting and Participation in Physical Activity on Youth Screen Time

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## KEY WORDS

television, parenting, physical activity, adolescents

## ABBREVIATIONS

YMCLS—Youth Media Campaign Longitudinal Survey

AAP—American Academy of Pediatrics

CDC—Centers for Disease Control and Prevention

CI—confidence interval

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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**WHAT'S KNOWN ON THIS SUBJECT:** Children's screen time should be limited to  $\leq 2$  hours/day. Strategies to limit excessive screen time include development of parental rules (studies have not yet examined the importance of consistency) and promotion of physical activity (study results have been mixed).



**WHAT THIS STUDY ADDS:** Rules that were consistent and that were reported by both parents and children were associated with the lowest prevalence of children exceeding recommended screen-time limits. Children's odds of exceeding screen-time limits decreased as the number of physical activity sessions increased.

## abstract

FREE

**OBJECTIVES:** To examine the associations of demographics, rules associated with television-viewing, and physical activity with daily screen time (including television, non-school-related computer use, and video games) in children and adolescents.

**METHODS:** We analyzed data from a telephone survey of 7415 youth aged 9 to 15 years from the Youth Media Campaign Longitudinal Survey. We used logistic regression models to calculate odds of exceeding recommended screen-time limits ( $>120$  minutes/day) according to demographics, rules, and physical activity.

**RESULTS:** Odds that children would exceed recommended screen-time limits were positively associated with age and black race/ethnicity and negatively associated with income level. Children and adolescents who reported that they really agreed that their parents had rules about time spent watching television and playing video games were less likely to exceed recommended limits than those who strongly disagreed that their parents had rules. Similarly, when parents reported always or very often having limits on television watching (versus rarely or never) and when parents correctly identified the recommended limits, children were less likely to exceed recommended limits. Children whose parents reported consistent limits and who themselves reported consistent rules about time spent watching television had the lowest prevalence of exceeding recommended limits. Odds that children would exceed recommended limits decreased as physical activity in the previous week increased.

**CONCLUSIONS:** Parental rules regarding screen time and participation in physical activity play a role in the amount of screen time among children and adolescents. Programs that encourage limit-setting by parents and promote physical activity may reduce screen time among youth. *Pediatrics* 2010;126:e89–e96

The viewing of screen media (television, videos, DVDs, video games, and computers for non-school-related use) affects multiple aspects of child and adolescent health. Screen-media use has been associated with youth alcohol use,<sup>1</sup> precocious sexual practices,<sup>2</sup> negative body concept,<sup>3</sup> eating disorders,<sup>4</sup> aggressive behaviors,<sup>5,6</sup> worsened educational achievement,<sup>7</sup> and higher BMI.<sup>8,9</sup> Most screen media viewed by children comprise television, videos, and DVDs.<sup>10</sup> The American Academy of Pediatrics (AAP) recommends that pediatricians advise parents of children older than 2 years to “limit children’s total media time (with entertainment media) to no more than 1 to 2 hours of quality programming per day,”<sup>11</sup> and the goal of increasing the proportion of adolescents who view television 2 or fewer hours on a school day is a *Healthy People 2010* objective.<sup>12</sup>

To help in the development of effective programs to reduce screen time, investigators must more closely examine the association of youth screen time with modifiable factors such as the presence of consistent parental rules and children’s levels of physical activity. Parental rules can effectively limit or deter adolescents from participating in excessive television-viewing.<sup>13,14</sup> However, it is not just the presence or absence of rules that is important but also the consistency of the rules and whether children and adolescents are aware of the rules.<sup>15</sup> Intuitively, participation in physical activity seems likely to be associated with limited screen time; however, previously reported evidence regarding such an association has been inconclusive.<sup>16–18</sup> In this study, we examined whether demographic characteristics, consistency of rules about television- and video-viewing (reported by both parent and child), and physical activity were associated with screen time

(television, computer games, and video games) in a sample of 9- to 15-year-olds throughout the United States.

## METHODS

The Youth Media Campaign Longitudinal Survey (YMCLS) is a prospective, longitudinal study of a cohort of children who were initially selected to be representative of the US population and their parents. The YMCLS was designed for the evaluation of the Centers for Disease Control and Prevention (CDC) VERB campaign.<sup>19</sup> The survey was administered via computer-assisted telephone interviews conducted on 2 panels chosen through a list-assisted random-digit-dial method to select a sample of households. A 1-minute screening survey was used to identify households with children aged 9 to 13 years. Parents and children completed separate interviews. Panel 1 surveys were conducted yearly from 2002 to 2006, and panel 2 surveys were conducted yearly from 2004 to 2006. Specifics about the sampling procedure and weighting have been reported elsewhere.<sup>19</sup> The institutional review board at the CDC approved the study.

For this analysis we combined the 2004 data from panel 1 (youth aged 11–15 years,  $n = 2256$ ) and panel 2 (youth aged 9–13 years,  $n = 5177$ ). In 2002, 60.5% of selected households completed a screening interview to determine eligibility to participate in panel 1, and the cumulative response rate for 2002–2004 (the product of the completion rate for the screening, parent, and child interviews) was 31.9%. In 2004, 58.8% of selected households completed a screening interview to determine eligibility for panel 2, and the overall response rate for 2004 was 43.9%. Five children were excluded from the analyses because they did not have complete information about

rules/limitations associated with television-viewing because they or their parent reported not having or not watching television, and 13 children were excluded because they did not have information about rules associated with playing video games because they reported not having or not playing video games. The final analytic sample included 7415 children and 5685 parents, including 1513 households with 2 or more children. Results were similar when the analysis was limited to 1 child per household.

## Demographic Variables

Data on age and gender of participating children were obtained from the adult screening interview and verified during parent interviews. Children’s race/ethnicity, parental education level, and parental income were obtained from the parent interview.

## Screen Time

Children were asked: “How many hours did you watch TV, play video games, or play computer games yesterday?” Children were instructed not to include time spent doing homework on the computer. Responses were recorded by the interviewer in hours and minutes. Screen time was categorized into approximate quartiles (ie, 0–30, 31–60, 61–120, and >120 minutes/day). The definition used for exceeding recommended screen time (>120 minutes/day) was based on the AAP’s recommended limit for entertainment-media time.<sup>11</sup>

## Rules and Limitations

Children and parents were asked about rules and limitations to television-viewing and playing video games. Children were asked how much they agreed (really agree, sort of agree, sort of disagree, or really disagree) with the statements “my parents have rules about how much time I can spend watching TV” and “my par-

ents have rules about how much time I can spend playing video games.” Children’s responses were collapsed into 3 categories (really agree, sort of agree/sort of disagree, and really disagree). Parents were asked how often (always, very often, sometimes, rarely, or never) they “set limits on the amount of time child watches TV” and “set limits on the amount of time child plays video games.” Responses were collapsed into 3 categories (always/very often, sometimes, and rarely/never). Parents also were asked to report the number of hours of television per day to which experts recommend children be limited and we collapsed this into 2 categories (choices were  $\leq 2$  or  $\geq 3$  hours).

### Physical Activity

Children were asked to report all of the physical activities in which they had participated during the previous 7 days and whether each activity was an organized activity that had a coach, instructor, or leader or if the activity was done during the child’s free time. Children were instructed to include activities that “got your body moving,” such as sports, physical activity lessons, or playing actively with their friends. Children were instructed to exclude activities during the school day, such as physical education and recess. We totaled the number of activities reported to create counts per week of physical activity sessions for organized, free-time, and total physical activity. Categories were created on the basis of quartiles for total sessions and free-time sessions. Because most children (60.7%) engaged in 0 sessions of organized activity per week, 3 categories were created for organized sessions. A study was conducted to determine the reliability and validity of the physical activity measurements, and the results showed acceptable test-retest reliability for reports of physical activity and significant moderate correla-

tions of those reports with detailed activity logs and data gathered by use of activity monitors.<sup>20</sup> Children were also asked if they currently played on any sports teams including teams run by their school or community group.

We conducted stratified data analyses to compare prevalence of television-viewing in approximate quartiles according to demographic characteristics, child-reported and parent-reported rules associated with television and video games, parent-reported knowledge of the recommended limits, and number of physical activity sessions. Each panel was weighted to population totals for children aged 9 to 13 years in the initial survey year after preliminary adjustments for differential probabilities of selection and nonresponse. Panel 1 was initially weighted to Census 2000 totals (<http://factfinder.census.gov>), and panel 2 was weighted to 2004 Current Population Survey totals ([www.bls.gov/cps](http://www.bls.gov/cps)). After additional adjustments were made for attrition in follow-up assessments for panel 1, weights were controlled to 2004 Current Population Survey totals for children aged 11 to 15 years. To account for the complex sampling design, SUDAAN 9.0 (Research Triangle Institute, Research Triangle Park, NC) was used to obtain estimates, and SEs were estimated by using the jackknife replication method. Analysis of unweighted data yielded similar results for associations.

### RESULTS

Adjusted odds of exceeding recommended screen-time limits were higher in boys than in girls, were positively associated with age ( $P$  for trend  $< .001$ ), and were negatively associated with parental income level ( $P$  for trend  $< .001$ ) (Table 1). Compared with white children, children in the black and other race/ethnicity cat-

egories were more likely to report exceeding recommended screen-time limits. The largest differences in the amount of screen time were associated with child age; 16.7% of children aged 9 to 10 years compared with 38.9% of children aged 14 to 15 years reported screen times of more than 2 hours/day, and 38.9% of children aged 9 to 10 years compared with 18.2% of children aged 14 to 15 years reported screen times of less than 30 minutes/day (Table 1).

Most parents (76.9%) reported having cable television available in the house. The presence of cable television was associated with children exceeding recommended screen-time limits (Table 2). Almost 1 in 4 parents reported that experts recommend children be limited to more than 3 hours of television per day (Table 2). Children whose parents identified the recommended limit as 2 or fewer hours/day were less likely to report child’s screen times that exceeded this limit.

Fewer than half (49.2%) of the parents reported that they always or very often placed limits on the time their child could watch television, whereas 37.1% of children really agreed that their parents had rules about how much television the child could watch (Table 2). Children who reported really agreeing that their parents had rules about how much time the child could spend watching television and playing video games were less likely to exceed recommended limits compared with those who really disagreed that their parents had rules. Similarly, children of parents who reported always or very often having limits on time the child watched television were less likely to exceed recommended limits for screen time; however, this association was not significant in relation to playing video games. Rules about television-viewing and playing video games were not significantly associ-

**TABLE 1** Prevalence of Quartiles of Screen Time and Odds Ratios of Exceeding Recommended Limits According to Select Demographics: Youth Media Campaign Longitudinal Survey, 2004

Characteristic	Sample, <i>n</i> (%) <sup>a</sup>	Prevalence of Screen Time				Exceeding Recommended Limits of >120 min/d, Adjusted Odds Ratio <sup>b</sup> (95% CI)
		0–30 min/d, % (95% CI)	31–60 min/d, % (95% CI)	61–120 min/d, % (95% CI)	>120 min/d, % (95% CI)	
Overall	7415 (100)	27.4 (26.0–28.8)	22.1 (21.0–23.3)	23.3 (22.1–24.5)	27.2 (25.8–28.6)	
Gender						
Male	3840 (51.0)	27.4 (25.7–29.2)	20.6 (19.0–22.2)	23.8 (22.0–25.6)	28.3 (26.5–30.1)	1.16 (1.00–1.34)
Female	3575 (49.0)	27.4 (25.5–29.3)	23.8 (22.1–25.5)	22.8 (21.1–24.5)	26.1 (24.0–28.2)	1.00
Age group, y <sup>c</sup>						
9–10	2040 (28.1)	38.9 (36.2–41.7)	24.5 (22.2–26.9)	19.9 (17.9–22.1)	16.7 (14.8–18.7)	1.00
11–12	2906 (29.5)	28.1 (26.2–30.0)	23.0 (21.2–24.8)	24.6 (23.0–26.3)	24.3 (22.6–26.2)	1.62 (1.39–1.89)
13	1588 (14.4)	21.2 (18.9–23.7)	22.7 (20.3–25.3)	25.3 (22.9–27.8)	30.8 (28.3–33.5)	2.29 (1.87–2.81)
14–15	881 (28.0)	18.2 (15.3–21.6)	18.7 (15.8–21.8)	24.2 (21.0–27.8)	38.9 (35.1–42.8)	3.18 (2.53–3.98)
Race/ethnicity						
White	4420 (60.7)	28.6 (26.9–30.3)	24.2 (22.8–25.6)	24.1 (22.5–25.7)	23.2 (21.6–24.9)	1.00
Black	988 (15.6)	25.9 (21.8–30.6)	15.5 (13.1–18.3)	18.7 (16.0–21.6)	39.9 (35.1–44.8)	2.00 (1.59–2.51)
Hispanic	1472 (17.1)	24.2 (21.4–27.1)	22.4 (19.5–25.7)	25.2 (22.4–28.3)	28.2 (24.9–31.7)	1.18 (0.95–1.45)
Other	535 (6.6)	28.3 (24.0–33.1)	18.5 (14.4–23.4)	22.1 (18.1–26.7)	31.1 (25.6–37.2)	1.47 (1.09–1.97)
Parental education						
Less than high school graduate	646 (9.0)	23.5 (20.0–27.4)	21.7 (16.4–28.1)	22.4 (17.3–28.6)	32.4 (26.9–38.4)	1.31 (0.97–1.75)
High school graduate	1873 (27.2)	25.7 (23.0–28.5)	22.2 (19.8–24.8)	23.5 (21.4–25.6)	28.7 (26.1–31.4)	1.20 (1.02–1.42)
Some college	2463 (33.3)	27.9 (25.6–30.2)	21.3 (19.4–23.4)	22.3 (20.3–24.4)	28.5 (25.8–31.4)	1.20 (1.00–1.45)
College graduate	2433 (30.4)	29.5 (27.3–31.9)	23.1 (21.3–25.0)	24.5 (22.5–26.6)	22.9 (20.7–25.1)	1.00
Parental income						
\$25 (000 or less	1487 (21.9)	23.8 (20.6–27.2)	20.4 (17.4–23.8)	22.2 (19.4–25.4)	33.6 (29.6–37.8)	1.61 (1.32–1.96)
\$25 (001–\$50 (000	1944 (26.4)	28.8 (26.0–31.9)	21.0 (18.6–23.7)	21.7 (19.5–24.1)	28.4 (25.7–31.2)	1.43 (1.19–1.72)
\$50 (001–\$75 (000	1617 (21.2)	25.3 (22.4–28.5)	22.0 (19.5–24.6)	24.0 (21.6–26.5)	28.7 (26.1–31.5)	1.53 (1.28–1.83)
More than \$75 (000	2367 (30.5)	30.2 (27.7–32.8)	24.4 (22.4–26.6)	24.9 (23.1–26.8)	20.5 (18.8–22.3)	1.00

<sup>a</sup> Sample percentages were weighted.

<sup>b</sup> Adjusted models include gender, age (continuous, except for estimates according to age group), race/ethnicity, and parental income except for models that included parental education, which were adjusted for gender, age, and race/ethnicity.

<sup>c</sup> Adjusted OR for continuous age: 1.26 (95% CI: 1.20–1.31).

ated with less screen time when children reported that they sort of agreed or disagreed that rules were present (versus really disagree), nor were the rules significantly associated with less screen time when parents reported sometimes having limits (versus rarely/never).

Children who really agreed that their parents had rules limiting television time had a higher prevalence of watching less than 30 minutes/day of television and a lower prevalence of watching more than 120 minutes/day than those who really disagreed that their parents had rules (Table 2). The same association was observed for children whose parents reported always/very often having limits to television watching (versus rarely/never).

Among children whose parents reported always or very often having

rules about the amount of television time, fewer than half, 47.3% (95% confidence interval [CI]: 45.3–49.3) reported really agreeing that their parents had rules, 34.9% (95% CI: 33.1–36.8) reported sort of agreeing or sort of disagreeing, and 17.8% (95% CI: 16.4–19.2) reported really disagreeing (data not shown). Children whose parents reported having rules always or very often and who themselves reported really agreeing that their parents had rules about how much television they could watch had the lowest prevalence of exceeding recommended screen-time limits (18.1%) (Fig 1).

Physical activity was negatively associated with screen time (Table 3). Being on a sports team was associated with children being less likely to exceed recommended screen-time limits. As the

number of total physical activity sessions (combined free-time and organized activities) increased, the odds of exceeding recommended screen-time limits decreased (*P* for trend < .001). This trend was also observed when we examined free-time (*P* for trend < .001) and organized (*P* for trend = .02) physical activity sessions separately.

## DISCUSSION

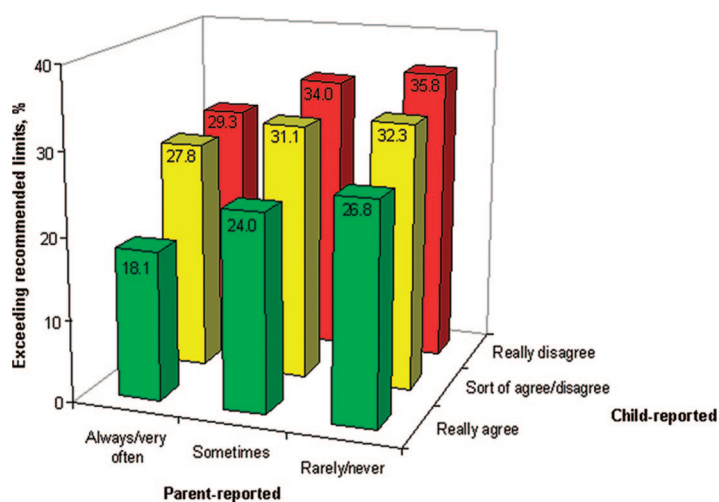
The AAP recommends that children aged 2 years or older engage in no more than 2 hours of quality media time per day.<sup>11</sup> We found that more than 27% of youth aged 9 to 15 years exceed the recommended limit of screen time and that boys, children of black race/ethnicity, and children from lower-income families exceed this limit more than other populations. We also found that the likelihood that youth would exceed recommended

**TABLE 2** Prevalence of Quartiles of Screen Time and Odds Ratios of Exceeding Recommended Limits According to Rules (as Reported by Both Child and Parent), Parents' Awareness of Recommended Limits, and Presence of Cable Television: Youth Media Campaign Longitudinal Survey, 2004

Characteristic	Sample, <i>n</i> (%) <sup>a</sup>	Prevalence of Screen Time				Exceeding Recommended Limits of >120 min/d, Adjusted Odds Ratio <sup>b</sup> (95% CI)
		0–30 min/d, % (95% CI)	31–60 min/d, % (95% CI)	61–120 min/d, % (95% CI)	>120 min/d, % (95% CI)	
<b>Child reported</b>						
Parents have rules limiting their time spent watching television						
Really agree	2913 (37.1)	32.3 (30.0–34.7)	24.5 (22.5–26.6)	22.6 (20.7–24.5)	20.6 (18.6–22.7)	0.66 (0.55–0.80)
Sort of agree/sort of disagree	2853 (38.4)	23.6 (22.0–25.3)	21.9 (20.4–23.5)	24.6 (22.7–26.7)	29.9 (28.0–31.9)	0.99 (0.83–1.19)
Really disagree	1649 (24.5)	25.8 (23.1–28.7)	18.9 (16.7–21.4)	22.3 (19.9–24.9)	32.9 (29.7–36.3)	1.00
Parents have rules limiting their time spent playing video games						
Really agree	3338 (42.5)	31.0 (29.2–32.9)	24.4 (22.6–26.2)	23.6 (21.8–25.5)	21.0 (19.2–23.0)	0.69 (0.58–0.83)
Sort of agree/sort of disagree	2471 (33.0)	23.0 (21.3–24.9)	21.2 (19.4–23.3)	24.6 (22.4–27.0)	31.1 (28.8–33.6)	1.05 (0.85–1.29)
Really disagree	1606 (24.6)	26.9 (24.4–29.6)	19.5 (17.3–21.9)	21.0 (18.6–23.7)	32.5 (29.4–35.8)	1.00
<b>Parent reported</b>						
Set limits on time child watches television						
Always/very often	3828 (49.2)	31.8 (29.6–34.0)	22.3 (20.8–23.9)	22.5 (20.9–24.1)	23.5 (21.5–25.5)	0.75 (0.62–0.91)
Sometimes	2235 (30.4)	22.8 (20.6–25.2)	22.4 (20.0–24.9)	25.1 (23.2–27.2)	29.7 (27.3–32.1)	0.95 (0.77–1.17)
Rarely/never	1352 (20.4)	23.6 (21.1–26.4)	21.3 (18.7–24.2)	22.6 (19.9–25.5)	32.5 (28.9–36.3)	1.00
Set limits on time child plays video games						
Does not have/does not play	713 (9.8)	28.1 (24.5–32.0)	24.2 (20.3–28.7)	23.2 (19.0–28.0)	24.5 (20.7–28.8)	0.87 (0.67–1.13)
Always/very often	3312 (42.5)	31.0 (29.1–33.0)	22.1 (20.4–23.8)	23.0 (21.4–24.8)	23.9 (22.1–25.9)	0.90 (0.73–1.11)
Sometimes	1726 (23.1)	22.6 (20.1–25.4)	21.1 (18.6–23.8)	24.4 (22.1–27.0)	31.8 (29.0–34.8)	1.20 (0.96–1.50)
Rarely/never	1664 (24.6)	25.3 (22.9–27.9)	22.5 (19.8–25.3)	22.7 (20.2–25.4)	29.5 (26.3–32.8)	1.00
Hours per day of television experts recommend as limit						
≤2	5875 (77.3)	28.7 (27.1–30.3)	23.0 (21.8–24.3)	23.8 (22.5–25.1)	24.5 (23.0–26.2)	0.78 (0.63–0.95)
≥3	1540 (22.7)	22.9 (19.7–26.4)	19.2 (16.8–21.8)	21.7 (19.2–24.3)	36.3 (32.3–40.4)	1.00
Have cable television in household						
Yes	5682 (76.9)	25.8 (24.4–27.2)	21.4 (20.3–22.7)	24.2 (22.8–25.6)	28.6 (27.0–30.2)	1.45 (1.20–1.74)
No	1733 (23.1)	32.6 (29.3–36.1)	24.4 (21.6–27.5)	20.3 (17.9–23.0)	22.6 (20.0–25.5)	1.00

<sup>a</sup> Sample percentages were weighted.

<sup>b</sup> All adjusted models include gender, age (continuous), race/ethnicity, and parental income.

**FIGURE 1**

Prevalence of youth who exceeded the recommended screen-time limit (>2 hours/day) according to child- and parent-reported rules: Youth Media Campaign Longitudinal Survey, 2004

screen-time limits was negatively associated with parents' being aware of recommended limits, the existence of con-

sistent parental rules, and increasing amounts of physical activity. Our study results suggest that programs that fo-

cus on development of parental limit-setting and/or promotion of physical activity may be effective in decreasing screen time among youth aged 9 to 15 years.

In our study population the prevalence of children who exceeded recommended screen-time limits was within the range of results from other national surveys. In a study in which investigators used data from the National Health and Nutrition Examination Survey, the overall prevalence estimates were slightly higher, with 32% of children aged 6 to 11 years and 35% of children aged 12 to 15 years exceeding recommended limits.<sup>9</sup> In another study among US high school students, 35.4% reported watching television 3 or more hours on an average school day.<sup>12</sup> Our estimates also seemed low

**TABLE 3** Prevalence of Quartiles of Screen Time and Odds Ratios of Exceeding Recommended Limits According to Sports Team Participation and Number of Physical Activity Sessions per Week (Free-Time, Organized, and Total): Youth Media Campaign Longitudinal Survey, 2004

Characteristic	Sample, <i>n</i> (%) <sup>a</sup>	Prevalence of Screen Time				Exceeding Recommended Limits of >120 min/d, Adjusted Odds Ratio <sup>b</sup> (95% CI)
		0–30 min/d, % (95% CI)	31–60 min/d, % (95% CI)	61–120 min/d, % (95% CI)	>120 min/d, % (95% CI)	
<b>Sports team</b>						
No	4529 (61.5)	26.3 (24.8–27.8)	20.7 (19.2–22.3)	23.6 (21.9–25.3)	29.5 (27.9–31.1)	1.00
Yes	2886 (38.5)	29.2 (27.1–31.3)	24.4 (22.8–26.1)	22.9 (21.1–24.7)	23.5 (21.5–25.7)	0.85 (0.75–0.97)
<b>Free-time PA sessions per wk</b>						
0–1	1965 (27.5)	27.3 (25.0–29.7)	20.6 (18.5–22.9)	21.6 (19.2–24.2)	30.5 (27.9–33.2)	1.00
2–4	1692 (23.8)	25.3 (22.6–28.2)	22.9 (20.2–25.9)	22.1 (19.8–24.7)	29.6 (26.7–32.8)	0.95 (0.79–1.14)
5–8	1948 (25.8)	27.2 (24.5–30.1)	22.2 (20.0–24.6)	24.1 (21.7–26.8)	26.4 (23.9–29.0)	0.79 (0.66–0.96)
≥9	1810 (22.9)	29.9 (27.2–32.6)	23.0 (21.1–25.1)	25.5 (23.0–28.3)	21.6 (19.0–24.4)	0.66 (0.53–0.82)
<b>Organized PA sessions per wk</b>						
0	4422 (60.7)	25.6 (24.0–27.3)	20.9 (19.6–22.3)	23.7 (22.2–25.3)	29.8 (28.0–31.6)	1.00
1–3	1707 (21.8)	30.4 (27.5–33.4)	24.2 (21.8–26.8)	23.1 (20.8–25.7)	22.3 (19.5–25.3)	0.87 (0.71–1.06)
≥4	1286 (17.4)	29.8 (26.5–33.2)	23.8 (20.8–27.1)	22.1 (19.5–24.8)	24.4 (21.7–27.4)	0.81 (0.67–0.97)
<b>Total PA sessions per wk</b>						
0–3	2096 (29.0)	26.4 (24.0–28.8)	19.7 (17.7–21.8)	21.6 (19.4–24.0)	32.3 (29.5–35.2)	1.00
4–6	1769 (25.2)	26.0 (23.6–28.5)	22.3 (20.2–24.7)	23.2 (20.8–25.8)	28.5 (25.5–31.8)	0.81 (0.66–0.99)
7–10	1874 (25.1)	26.4 (24.3–28.7)	23.5 (21.0–26.1)	24.5 (22.1–27.0)	25.6 (22.8–28.7)	0.74 (0.61–0.89)
≥11	1676 (20.7)	31.7 (28.7–34.9)	23.7 (21.5–26.1)	24.3 (21.7–27.1)	20.3 (17.9–22.9)	0.58 (0.47–0.72)

PA indicates physical activity.

<sup>a</sup> Sample percentages were weighted.

<sup>b</sup> All adjusted models include gender, age (continuous), race/ethnicity, and parental income.

when we compared them with results from the Kaiser Family Foundation, which reported that in 2004, 8- to 18-year-olds used screen media for ~4 hours/day.<sup>10</sup> However, in another study in which investigators used data from the National Survey of Children's Health, the overall prevalence estimates were lower than those in our study (children aged 6–17 years: 17.0%).<sup>21</sup> These differences in the estimates may have been attributable to different definitions of screen time (ie, whether playing video games and computer games was included with screen time), whether categorical and continuous responses for amount of screen time were included, whether the child or parent reported the screen time, and differences in sample characteristics. The disparities in exceeding recommended screen-time limits that we found among boys, children of black race/ethnicity, and children from lower-income families were consistent with results of other studies.<sup>10,12,22</sup>

Although our findings were similar to those reported for other studies,<sup>13,14</sup>

our study was unique in 2 ways. First, we examined the consistent enforcement of rules by asking parents to report how often they set limits and asking children to report how much they agreed that rules were present. Second, we examined the presence of rules as reported by parents and children. This area of investigation was important, because we found that children in families in which the parent and child agreed on the presence of rules had the lowest prevalence of exceeding recommended screen-time limits. We found, however, that fewer than half of the parents reported that they always or very often had limits on time spent watching television, and only ~37% of the children really agreed that they had rules. Thus, the development and use of messages and programs designed to increase the prevalence of households that implement consistent rules about television-viewing among youth may be an effective way to decrease screen time.

Our findings suggest that programs that focus on educating parents about

recommended limits and encouraging parents to set limits may be promoting viable strategies to reduce screen time. However, these methods should be tested empirically. We found no intervention studies that have specifically examined the effect of implementation of consistent rules by parents on reducing screen time. There have been studies, however, in which educating children,<sup>23</sup> and in some cases parents,<sup>24</sup> about limiting screen time was observed to be associated with reductions in screen time. Results of a study in which the intervention group implemented 5 lessons delivered for a 12-week period to parents and children at home indicated that children's screen time decreased.<sup>24</sup> The lessons in this study focused on several strategies (eg, self-monitoring to reduce television-viewing, replacing viewing time with other activities, and budgeting viewing hours). Education of children can increase their awareness of the importance of limiting television-viewing time, and inclusion of parents in this process can help increase their

awareness about recommended limits and about methods to limit screen time at home.

It makes intuitive sense that time spent in physical activity could displace screen time or screen time could displace time spent in physical activity. Our cross-sectional data did not allow us to determine the direction of this association; however, our findings showed that physical activity and screen time are negatively associated and thus supported the displacement hypothesis. Previous evidence has been inconclusive regarding this association<sup>16–18</sup>; however, some researchers have suggested that this displacement process may become more apparent after adolescence,<sup>25</sup> and our findings were similar to the results of 2 other studies with similar-aged children.<sup>26,27</sup> In addition, Epstein et al<sup>28</sup> have shown that in obese children, positive reinforcement of a decrease in sedentary behaviors is associated with increases in physical activity. The association we observed was for sports participation and organized and free-time activity, which suggests that the availability of opportunities to participate in physical activity, either organized or free time, may be 1 way to decrease screen time among 9- to 15-year-olds. Future work should examine the causal direction of the association to understand how these behaviors influence one another.

Our study had both strengths and limitations. As we previously mentioned, a

strength of our study was that we collected information on reported rules from both parents and children. Also, the reliability of our measures were tested in a sample of youth from 8 ethnically diverse schools, with a 1-week time period between administration of the YMCLS to youth at each of the schools. Our measures were found to have moderate-to-high reliability (moderate: total and free-time physical activity sessions; high: organized physical activity sessions, sports team participation, screen time, and children's reported rules about television and video-game use).<sup>29</sup> In addition, our measures of physical activity sessions have been shown to provide valid estimates of weekly physical activity.<sup>20</sup> Our use of data from a cohort of children initially selected to be nationally representative is another strength. However, because of low response rates and attrition over time, there is the possibility that parents and children who agreed to be in the study may not be representative of the US population. Nevertheless, the distribution of our unweighted sample was similar to that of our sample weighted to the US population, which suggests that our sample may have been broadly representative; thus, our results may be generalized to apply to a diverse population. In addition, the weights we applied in our analysis served to adjust for nonresponse and potential undercoverage, although the use of weights cannot adjust for the potential bias

introduced if survey nonresponse and/or undercoverage were associated with our variables of interest. Finally, our study was cross-sectional and could not be used to determine causality. Future work should examine the association between parental rules and physical-activity sessions by using a longitudinal design to determine if the age trajectories in screen time are modified by the existence of consistent rules or high levels of physical activity.

## CONCLUSIONS

In our study population, ~1 in 4 children and adolescents exceeded the recommended screen time limits of 2 hours/day. Boys, children from lower-income families, and African American children were more likely to report increased screen times. Our study results suggest that programs that focus on the development of parental limits and that promote physical activity may lead to decreased screen time among youth aged 9 to 15 years. Programs to reduce screen time must address the roles of parents and parental rules, target age, and socioeconomic characteristics of families. Programs might best be focused on educating parents about recommended limits and the importance of consistent rules. In addition, promotion of physical activity alternatives to sedentary screen-time behavior may be an appropriate strategy for reducing screen time among youth.

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