

Article

Parent and child reports of children's activity

by Fortune Sithole and Paul J. Veugelers

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Abstract

Objective

This article compares child reports of their physical and sedentary activities with those of their parents.

Data and Methods

Data were obtained from the 2003 Children's Lifestyle and School-performance Study (CLASS), a survey of Grade 5 students and their parents in the province of Nova Scotia, Canada. Survey data with responses from Grade 5 students and their parents about the students' physical and sedentary activities were used. Agreement between the parent and child reports was evaluated with weighted kappa. Multilevel logistic regression was used to compare the parent and child reports in relation to the child body weight.

Results

Agreement between the 3,958 pairs of parent and child reports was low to fair. Relative to normal weight children, those who were overweight or obese reported more participation in organized and leisure sports and less time watching television than what their parents perceived. Unlike child self-reports, parent reports demonstrated statistically significant associations between the child's activities and body weight.

Interpretation

Based on these findings, parent reports seem to provide a more accurate assessment of activity levels of children younger than 12.

Keywords

data collection, sports, television, body weight, obesity, screen time

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Despite some contradictory results,¹⁻⁴ the relationship between physical activity and obesity has been established.⁵⁻⁸ With the aim of providing direction for public health policies to prevent obesity, an increasing number of population-based studies now focus on determinants of activity, especially among children. Accurate assessment of physical and sedentary activity is essential to this research.

Population surveys use both child self-reports and parent proxy reports to quantify physical and sedentary activity in children and youth.^{9,10} Both sources of information, however, have drawbacks. Children may be forgetful, and their perception and judgment of quantity and duration are not well developed. On the other hand, parents may not be fully aware of their children's activities. Whether self-reports from children or proxy reports from parents provide the best information has never been analyzed, although this would seem to be essential to the planning, implementation and interpretation of surveys.

National and other large-scale population surveys, which are generally conducted by telephone, cannot easily accommodate the use of instruments such as accelerometers and pedometers to measure physical activity. And while such instruments are objective, they

have limitations; for example, they cannot be used in certain environments (some accelerometers cannot be worn underwater), and they create the potential for subject reactivity, especially in children.¹¹

Another challenge in obesity research is selective under-reporting. This has been shown to be the case for energy and fat intake by overweight and obese individuals.¹² A similar bias may apply to physical and sedentary activities, but this has never been studied.

To be able to better interpret survey findings on children's activity levels, this study evaluates responses of children and their parents to questions about sports (organized and leisure), television viewing, and computer use and video games. Differences in responses of normal weight, overweight and obese children are assessed.

Methods

Study design

The study was approved by the Research Ethics Board of Dalhousie University (Halifax, Canada), where the research was undertaken. Data were obtained from the 2003 Children's Lifestyle and School-performance Study (CLASS), a survey of Grade 5 students and their parents in the province of Nova Scotia, Canada.⁸ Students and their parents were asked about the students' physical and sedentary activities; validated questions from the National Longitudinal Survey of Children and Youth¹³ were used. The physical activity questions related to the frequency with which the children played: 1) organized sports (with a coach or instructor), and 2) leisure sports (without a coach or instructor). The responses were grouped into three categories: a) never or almost never, b) about once a month, and c) more than once a week. The questions about sedentary activities concerned the number of hours per day: 1) watching television, and 2) using a computer or playing video games. Again, the responses were grouped into three categories: a) one hour or less, b) more than one to three hours, and c) more than three hours.

Of the 291 public schools in Nova Scotia with Grade 5 classes, 282 participated in the survey and distributed a questionnaire and consent form to the parents of their Grade 5 students. Parents were asked to complete the questionnaire at home. Parental consent was obtained for 5,517 students, for an average response rate of 51.1% per school.

Study representatives then visited the schools to administer the survey to students and to measure their height and weight. Standing height was measured to the nearest 0.1 cm after the children had removed their shoes. Weight was measured to the nearest 0.1 kg on calibrated digital scales. Normal weight, overweight and obese categories were defined using the international body mass index (BMI)

cut-offs established for children and youth.¹⁴ These cut-offs are based on health-related adult definitions of overweight (25 kg/m² or more) and obesity (30 kg/m² or more), adjusted to specific age and sex groups for children.¹⁴ One of the seven provincial school boards did not allow measurement of height and weight. Students without height and weight measurements were excluded from this analysis, leaving a sample of 4,298 children from 242 schools.

Agreement

Since the responses to activity levels were ordered, the extent of agreement between the parent and child reports of the children's physical and sedentary activities was assessed with weighted kappa.¹⁵ A user-defined weighting system of 1 (perfect agreement), 0.25 (difference of 1 category) and 0 (difference of 2 categories) was used. For each activity, kappa scores were determined for the study population at large, and separately, for normal weight, overweight and obese children.

Extent of agreement and association with body weight

The parent and child reports were grouped into three categories: 1) children reported less activity; 2) agreement; and 3) children reported more activity. The association between these categories and children's weight status was determined with multilevel multivariate logistic regression, which accounted for within-school clustering of children. The analysis was adjusted for child gender, parental income, and parental education.

Relationship between parent and child reports and child's body weight

In separate analyses, the predictive potential of parent and child responses about activity levels with regard to the child's weight status was compared using multilevel multivariate logistic regression, while adjusting for child

gender, parental income, and parental education. These parent and child models were then compared with respect to: 1) the strength of the association between reported activities and weight status; 2) the statistical significance of these activities with weight status using the Wald statistic; and 3) how well the model explained body weight based on the Akaike Information Criterion (AIC),¹⁶ an index used to identify the best-fitting of two parallel models.¹⁶

The analyses were based on 3,940 parent-child pairs for organized sports; 3,958 pairs for leisure sports; 3,925 pairs for television viewing; and 3,955 pairs for computer and video game time. The number of pairs differed because of missing data on the activity questions for children and/or parents. Stata 9 (StataCorp, College Station, Texas) was used for all the statistical analyses.

Results

Agreement no more than fair

The agreement (kappa score) between children and their parents about the extent of the children's participation in organized sports was 0.41 (Table 1), which is considered fair.¹⁷ The kappa score for leisure sports was 0.11, which is considered low. The scores for television viewing and computer use/video games were 0.19 (low) and 0.23 (fair), respectively.

Children report more activity

Relative to their parents' perception, children reported significantly more hours of sedentary activities, with 34% reporting more television viewing and 33% reporting more computer use/video games (Table 2). Children also reported greater participation in physical activities, but these differences were not statistically significant (Table 2).

Children who reported more participation in organized and leisure sports than their parents were significantly more likely to be overweight or obese, compared with

Table 1
Agreement (measured using weighted Kappa) between parent and child reports of child's activities, by child's weight

Child's activities	Number of parent-child combinations	Child's weight							
		Total		Normal weight		Overweight		Obese	
		Kappa	95% confidence interval	Kappa	95% confidence interval	Kappa	95% confidence interval	Kappa	95% confidence interval
Organized sports	3,940	0.41	0.39 to 0.44	0.42	0.39 to 0.44	0.42	0.37 to 0.47	0.37	0.29 to 0.45
Leisure sports	3,958	0.11	0.08 to 0.14	0.09	0.06 to 0.13	0.16	0.09 to 0.23	0.11	0.01 to 0.25
Television viewing	3,925	0.19	0.16 to 0.21	0.20	0.18 to 0.24	0.16	0.10 to 0.21	0.10	0.03 to 0.18
Computer use and video games	3,955	0.23	0.20 to 0.25	0.23	0.19 to 0.25	0.22	0.17 to 0.26	0.25	0.16 to 0.33

Source: 2003 Children's Lifestyle and School-performance Study.

children who agreed with their parents (Table 2). And for sedentary activities, children who reported fewer hours of television than their parents were significantly more likely overweight or obese than children whose estimates agreed with those of their parents. Findings were similar when normal weight children were compared with obese children rather than with those who were overweight (including obese) (data not shown).

Parent reports related to child's body weight

Children whose parents reported them participating in organized and leisure sports at least once a week were significantly less likely to be overweight or obese than were children whose parents said that they rarely engaged in these activities (Table 3). As well, children whose parents reported that they spent more than three hours a day watching television were significantly more likely to be overweight or obese than were children whose parents said that they devoted no more than an hour a day to television. By contrast, activity levels self-reported by children were not significantly associated with overweight/obesity. AIC values for parent models were lower than those for child models for each activity, indicating that parent reports better explained the variation in weight status than did child reports (Table 3). Results were similar when normal weight children were compared with obese children, and when the gender of the

parent who completed the questionnaire was considered (data not shown).

Discussion

Children and parents who responded to the CLASS differed in their assessments of the children's activity levels. The children who reported more physical and less sedentary activity than what their parents perceived were more likely to be overweight or obese than were those who agreed with their parents. Unlike child self-reports, parent

reports were consistent with the established association between greater physical activity and healthy weight.

A total of 19 studies of the association between activity and weight in children were reviewed. Of these, four were based on parent proxy reports,^{6,10,18,19} and 15 on child self-reports.^{1-5,9,16,20-27} The findings of each of the four studies based on parent reports^{6,10,18,19} were consistent with the association between physical activity and weight. By contrast, four (27%) of the 15 studies based on child reports did not reveal

Table 2
Concurrence of parent and child reports of child's activities, and adjusted odds ratios relating reports of activity to overweight/obesity in child

Child's activities	Parent-child combinations		Child overweight/obesity	
	Number	%	Adjusted odds ratio	95% confidence interval
Organized sports				
Child reports less	618	16	0.90	0.74 to 1.10
Child reports same [†]	2,677	68	1.00	...
Child reports more	645	16	1.33*	1.11 to 1.60
Leisure sports				
Child reports less	292	7	0.86	0.65 to 1.13
Child reports same [†]	3,300	84	1.00	...
Child reports more	366	9	1.39*	1.11 to 1.74
Television viewing				
Child reports less	723	18	1.24*	1.04 to 1.49
Child reports same [†]	1,885	48	1.00	...
Child reports more	1,317	34	1.04	0.89 to 1.21
Computer use and video games				
Child reports less	556	14	1.07	0.87 to 1.31
Child reports same [†]	2,089	53	1.00	...
Child reports more	1,310	33	0.95	0.82 to 1.11

[†] reference category

[‡] adjusted for child gender, parental income and parental education

* significantly greater odds of being overweight or obese compared with reference category (p < 0.05)

... not applicable

Source: 2003 Children's Lifestyle and School-performance Study.

Table 3
Adjusted odds ratios relating child overweight/obesity to parent and child reports of child's activities

Child's activities	Child overweight/obesity				AIC [§] (parent minus child)
	Adjusted [†] odds ratio based on parent report	95% confidence interval	Adjusted [†] odds ratio based on child report	95% confidence interval	
Organized sports					
Almost never [†]	1.00	...	1.00	...	-253
Once per month	0.87	0.66 to 1.17	1.00	0.80 to 1.25	
At least once per week	0.72*	0.62 to 0.85	0.97	0.81 to 1.15	
	p-value < 0.01 ^{¶¶}		p-value = 0.89 ^{¶¶}		
Leisure sports					
Almost never [†]	1.00	...	1.00	...	-11
Once per month	0.86	0.57 to 1.23	0.81	0.50 to 1.33	
At least once per week	0.63*	0.47 to 0.85	0.89	0.58 to 1.34	
	p-value < 0.01 ^{¶¶}		p-value = 0.70 ^{¶¶}		
Television viewing					
One hour or less a day [†]	1.00	...	1.00	...	-19
More than 1 to 3 hours a day	1.20	0.96 to 1.49	1.21	0.97 to 1.50	
More than 3 hours a day	1.68*	1.32 to 2.14	1.30*	1.05 to 1.61	
	p-value < 0.01 ^{¶¶}		p-value = 0.06 ^{¶¶}		
Computer use and video games					
One hour or less a day [†]	1.00	...	1.00	...	-4
More than 1 to 3 hours a day	1.15	0.99 to 1.33	0.96	0.83 to 1.12	
More than 3 hours a day	1.23	0.91 to 1.64	1.01	0.83 to 1.23	
	p-value < 0.01 ^{¶¶}		p-value = 0.84 ^{¶¶}		

[†] reference category

[‡] adjusted for child gender, parental income and parental education

[§] Akaike Information Criterion: negative values (parent AIC minus student AIC) indicate that parent reports provide model with better fit than child model

^{¶¶} p-value based on Wald statistic; values below 0.05 indicate statistically significant improvement of model if activity covariate is added to model

* significantly different from reference category (p < 0.05)

... not applicable

Source: 2003 Children's Lifestyle and School-performance Study.

such an association. This percentage may be even higher than 27% due to publication bias, whereby studies with positive findings are more likely to be published than are those that fail to reveal an association. Of the four studies based on parent reports, three pertained to children aged 4 to 7,^{6,10,19} and one, to children aged 8 to 12.¹⁸ The 15 studies based on child self-reports^{1-5,9,16,20-27} concerned children of at least 8 years of age; thirteen of these studies included 10- and 11-year-olds, the ages of the children in the present analysis.

A "social desirability bias" may apply to the findings from the CLASS. Despite the apparently evident causal relationship between high calorie consumption and overweight,²⁸⁻³⁰ various studies have failed to confirm it.³¹⁻³³ Investigators have suggested

that under-reporting of food intake by overweight individuals accounts for this failure, and refer to this tendency as "social desirability bias." The present study shows that such a bias may also apply to the reporting of activity, as children who reported more physical and less sedentary activity than was perceived by their parents were more likely to be overweight or obese than were children who agreed with their parents. (Selective under-reporting of physical activity by parents of overweight children may also contribute to this observation.) Social desirability bias would be best demonstrated in a validation study comparing child self-reports with an objective measure of physical activity, but we are not aware of the existence of such a study.

The limitations of self- and proxy reports of activity are evident—they

are subjective and require judgment about the quantity and duration of activities. Nonetheless, public health researchers recognize advantages of self-reports over measurements from instruments such as pedometers and accelerometers. Self-reports are more convenient for large population-based surveys: participation rates are higher, and costs are lower. And compared with the step-counts obtained from pedometers, the data derived from self-reports of participation in various activities translate more easily into public health policy recommendations such as support for organized sports facilities or for safe neighborhoods in which children can play.

This analysis used the relationship between activity and weight to assess the accuracy of parent and child reports. Though not a conventional method of validation, it is a logical way of comparing reports of activity levels, particularly in a large-scale population-based survey like the CLASS that used questionnaires. Moreover, weight status in this study was objective, as height and weight were directly measured.^{34,35} The parent reports were consistent with the relationship between activity and weight status, suggesting that they may be more accurate than self-reports by children of these ages.

In summary, children and parents differed in their perceptions of the children's activity. Children who reported more physical activity but less sedentary activity than their parents were more likely to be overweight or obese than were children whose accounts agreed with those of their parents. These results, of course, are based on only one study of children in one elementary grade in a province of Canada. Additional research is needed to confirm that parent reports are more reliable assessments of children's activities than are those of the children themselves. ■

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References

- Hernandez B, Gortmaker SL, Colditz GA, et al. Association of obesity with physical activity, television programs and other forms of video viewing among children in Mexico city. *International Journal of Obesity-Related Metabolic Disorders* 1999; 23(8): 845-54.
- McMurray RG, Harrell JS, Deng S, et al. The influence of physical activity, socioeconomic status, and ethnicity on the weight status of adolescents. *Obesity Research* 2000; 8(2):130-9.
- Robinson TN, Hammer LD, Killen JD, et al. Does television viewing increase obesity and reduce physical activity? Cross-sectional and longitudinal analyses among adolescent girls. *Pediatrics* 1993; 91(2): 273-80.
- Vandewater EA, Shim MS, Caplovitz AG. Linking obesity and activity level with children's television and video game use. *Journal of Adolescence* 2004; 27(1): 71-85.
- Janssen I, Katzmarzyk PT, Boyce WF, et al. Comparison of overweight and obesity prevalence in school-aged youth from 34 countries and their relationships with physical activity and dietary patterns. *Obesity Reviews* 2005; 6(2): 123-32.
- Janz KF, Levy SM, Burns TL, et al. Fatness, physical activity, and television viewing in children during the adiposity rebound period: the Iowa Bone Development Study. *Preventive Medicine* 2002; 35(6): 563-71.
- Shields M. Overweight and obesity among children and youth. *Health Reports* (Statistics Canada, Catalogue 82-003) 2006; 17(3): 27-42.
- Veugelers PJ, Fitzgerald AL. Prevalence of and risk factors for childhood overweight and obesity. *Canadian Medical Association Journal* 2005; 173(6): 607-13.
- Koezuka N, Koo M, Allison KR, et al. The relationship between sedentary activities and physical inactivity among adolescents: Results from the Canadian Community Health Survey. *Journal of Adolescent Health* 2006; 39: 515-22.
- Tremblay MS, Willms JD. Is the Canadian obesity epidemic related to physical inactivity? *International Journal of Obesity* 2003; 27: 1100-5.
- Esliger DW, Copeland JL, Barnes JD, et al. Standardizing and optimizing the use of accelerometer data for free-living physical activity monitoring. *Journal of Physical Activity and Health* 2005; 3: 366-83.
- Heitmann BL, Lissner L. Dietary underreporting by obese individuals— is it specific or non-specific? *British Medical Journal* 1995; 311(7011): 986-9.
- Statistics Canada. National Longitudinal Survey of Children and Youth (NLSCY). Available at: www.statcan.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=4450&lang=en&db=IMDB&dbg=f&adm=8&dis=2. Accessed July 26, 2005.
- Cole TJ, Bellizzi MC, Flegal KM, et al. Establishing a standard definition for child overweight and obesity worldwide: international survey. *British Medical Journal* 2000; 320(7244): 1240-3.
- Sim J, Wright CC. The kappa statistic in reliability studies: use, interpretation, and sample size requirements. *Physical Therapy* 2005; 85(3): 257-68.
- Dohoo I, Martin W, Stryhn H. *Veterinary Epidemiologic Research*. Charlottetown, PEI, Canada: AVC Inc., 2003.
- Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977; 33(1): 159-74.
- Epstein LH, Paluch RA, Gordy CC, et al. Decreasing sedentary behaviors in treating pediatric obesity. *Archives of Pediatrics and Adolescent Medicine* 2000; 154(3): 220-6.
- Graf C, Koch B, Dordel S, et al. Physical activity, leisure habits and obesity in first-grade children. *European Journal of Cardiovascular Prevention and Rehabilitation* 2004; 11(4): 284-90.
- Deforche B, Lefevre J, De Bourdeaudhuij I, et al. Physical fitness and physical activity in obese and nonobese Flemish youth. *Obesity Research* 2003; 11(3): 434-41.
- Dowda M, Ainsworth BE, Addy CL, et al. Environmental influences, physical activity, and weight status in 8- to 16-year-olds. *Archives of Pediatrics and Adolescent Medicine* 2001; 155(6): 711-7.
- Eisenmann JC, Bartee RT, Wang MQ. Physical activity, TV viewing, and weight in U.S. youth: 1999 Youth Risk Behavior Survey. *Obesity Research* 2002; 10(5): 379-85.
- Gordon-Larsen P, Adair LS, Popkin BM. Ethnic differences in physical activity and inactivity patterns and overweight status. *Obesity Research* 2002; 10(3): 141-9.

24. Janssen I, Katzmarzyk PT, Boyce WF. Overweight and obesity in Canadian adolescents and their associations with dietary habits and physical activity patterns. *Journal of Adolescent Health* 2004; 35(5): 360-7.
25. Lowry R, Wechsler H, Galuska DA, et al. Television viewing and its associations with overweight, sedentary lifestyle, and insufficient consumption of fruits and vegetables among US high school students: differences by race, ethnicity, and gender. *Journal of School Health* 2002; 72(10): 413-21.
26. Tanasescu M, Ferris AM, Himmelgreen DA, et al. Biobehavioral factors are associated with obesity in Puerto Rican children. *Journal of Nutrition* 2000; 130(7): 1734-42.
27. Wolf AM, Gortmaker SL, Cheung L, et al. Activity, inactivity, and obesity: racial, ethnic, and age differences among schoolgirls. *American Journal of Public Health* 1993; 83(11): 1625-7.
28. Berkey CS, Rockett HR, Field AE, et al. Activity, dietary intake, and weight changes in a longitudinal study of preadolescent and adolescent boys and girls. *Pediatrics* 2000; 105(4): E56.
29. Maffeis C, Provera S, Filippi L, et al. Distribution of food intake as a risk factor for childhood obesity. *International Journal of Obesity and Related Metabolic Disorders* 2000; 24(1): 75-80.
30. McGloin AF, Livingstone MB, Greene LC, et al. Energy and fat intake in obese and lean children at varying risk of obesity. *International Journal of Obesity and Related Metabolic Disorders* 2002; 26(2): 200-7.
31. Atkin LM, Davies PS. Diet composition and body composition in preschool children. *American Journal of Clinical Nutrition* 2000; 72(1): 15-21.
32. Kimm SY. The role of dietary fiber in the development and treatment of childhood obesity. *Pediatrics* 1995; 96(5 Pt 2): 1010-4.
33. Maffeis C, Talamini G, Tato L. Influence of diet, physical activity and parents' obesity on children's adiposity: a four-year longitudinal study. *International Journal of Obesity and Related Metabolic Disorders* 1998; 22(8): 758-64.
34. Elgar FJ, Roberts C, Tudor-Smith C, et al. Validity of self-reported height and weight and predictors of bias in adolescents. *Journal of Adolescent Health* 2005; 37(5): 371-5.
35. Niedhammer I, Bugel I, Bonenfant S, et al. Validity of self-reported weight and height in the French GAZEL cohort. *International Journal of Obesity and Related Metabolic Disorders* 2000; 24(9): 1111-8.