JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2009, **42,** 1–16 NUMBER 1 (SPRING 2009)

ASSESSING CHILDREN'S PHYSICAL ACTIVITY IN THEIR HOMES: THE OBSERVATIONAL SYSTEM FOR RECORDING PHYSICAL ACTIVITY IN CHILDREN–HOME

KERRY L. MCIVER
EAST CAROLINA UNIVERSITY

WILLIAM H. BROWN
UNIVERSITY OF SOUTH CAROLINA

KARIN A. PFEIFFER
MICHIGAN STATE UNIVERSITY

AND

MARSHA DOWDA AND RUSSELL R. PATE
UNIVERSITY OF SOUTH CAROLINA

The present study describes the development and pilot testing of the Observation System for Recording Physical Activity in Children–Home version. This system was developed to document physical activity and related physical and social contexts while children are at home. An analysis of interobserver agreement and a description of children's physical activity in various settings are presented. The system, which was shown to be reliable, provides a direct observation tool for researchers who are interested in assessing and intervening in physical activity in the home environment.

DESCRIPTORS: direct observation, home environment, physical activity, physical environment, preschool children

Understanding the social and environmental contexts associated with participation in physical activity is a critical public health issue (Pate, 2001; Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004). Currently, 13.9% of all preschool-aged children are overweight and an additional 12.3% are at risk for becoming overweight (Ogden et al., 2006). In addition, rates are higher for African-American and Hispanic children and in children from low socioeconomic backgrounds. More troubling is that children who were above the 85th percentile for body mass index at 24, 36, or 54 months of age were over five times more likely to be overweight at 12 years of age compared to peers who were below the 85th percentile; further, 60% of children who were overweight as preschoolers were also overweight at 12 years of age (Nader et al., 2006). The causes of the population trend in childhood obesity have not been identified definitively. However, it is likely that reduced physical activity and increased participation in sedentary behaviors are important contributing factors (Dennison, Erb, & Jenkins, 2002; Epstein, Paluch, Gordy, & Dorn, 2000; Gortmaker et al., 1996).

Preparation of this article was partially supported by Grant 3R01HD043125-02S2 from the National Institutes of Health. The content and opinions expressed herein do not necessarily reflect the position or policy of the University of South Carolina or the National Institutes of Health, and no official endorsement should be inferred. We thank Carrie Zier for her excellence in data collection and Kristen Swaney and Chevy Jeter for their help in coordinating the project.

Correspondence concerning this article should be addressed to Kerry L. McIver, 160 Minges Coliseum, Department of Exercise and Sport Science, College of Health and Human Performance, East Carolina University, Greenville, North Carolina 27858 (e-mail: mciverkl@mailbox.sc.edu).

doi: 10.1901/jaba.2009.42-1

A better understanding of the moment-to-moment circumstances of children's physical activity might inform the development of effective physical-activity interventions. Critical settings for potential interventions to enhance children's physical activity include schools, homes, and neighborhoods (Fulton et al., 2001; Pate, 2001). To date, however, the objective measurement of the environmental circumstances within these settings has been limited. For example, self-reports of physical activity are likely to be influenced by social demands and biases, especially in young children, who are often less capable of reporting accurate information and whose reports are influenced greatly by adults (Sallis, 1991). Proxy reports, most often given by parents, are also limited because adults are frequently not observing the child's behavior throughout the day. Hence, better assessment tools are necessary to capture the potential contributing factors related to young children's physical activity.

To overcome some of these obstacles, many researchers use accelerometers, which are small, electronic devices that record and report levels of physical activity (e.g., the ActiGraph, ActiGraph LLC; the Actical, Mini-Mitter, Respironics, Inc). Accelerometers are typically worn at the waist and record accelerations in movement, thus quantifying periods of activity based on age-specific energy expenditure equations. Some contend that accelerometry is the gold standard for assessment of individuals' physical activity (e.g., Sirard & Pate, 2001); however, the method is limited in the information provided, particularly the types of activities performed and the context in which individuals perform physical activities.

By contrast, direct observations afford researchers the ability to assess behavior in an individual's day-to-day environment while providing opportunities to document factors associated with behaviors of interest (Bijou, Peterson, & Ault, 1968; Hartmann & Wood, 1990). With respect to children's physical activity, direct observations allow investigators to understand moment-to-moment activity in a variety of contexts and settings. Previous observation systems have been useful in describing children's activity levels but have not been designed to describe the social and environmental circumstances associated with various amounts of physical activity. The Children's Activity Rating Scale (CARS) was one of the first systems to provide information on coding children's activity intensity levels (Baranowski, Thompson, DuRant, Baranowski, & Puhl, 1992; Durant et al., 1993; Finn & Specker, 2000). The CARS, however, is restricted to rating the intensity of physical activity. The Behaviors of Eating and Activity for Child Health Evaluation System (BEACHES; McKenzie et al., 1991) and the System for Observing Play and Leisure Activity in Youth (SOPLAY; McKenzie, Marshall, Sallis, & Conway, 2000) provide observers with the ability to code intensity of physical activity and relatively global environmental information such as whether individuals are inside or outside their homes or schools. However, BEACHES and SOPLAY do not isolate the moment-to-moment social and environmental circumstances researchers might want to identify. The Observational System for Recording Physical Activity in Children–Preschool (OSRAC-P) improved on previous observational systems by expanding categories to include information on many common indoor and outdoor activity contexts, social groups, and topography of physical activity (Brown et al., 2006). Whereas the OSRAC-P allows a more complete description of children's physical activity and its moment-to-moment contextual circumstances, the observational system has been limited to use in preschool environments. To better describe and understand children's physical activity in their homes, we developed and pilot tested the Observational System for Recording Physical Activity in Children–Home (OSRAC-H). The

purpose of our paper is to provide preliminary data on children's physical activity in their homes collected with the OSRAC-H and to provide interobserver agreement analyses of the same data.

METHOD

Development of the OSRAC-H

To develop the OSRAC-H, a preliminary evaluation of the existing direct observation system, OSRAC-P (Brown et al., 2006), was conducted by a team of researchers who developed the observational assessment. The OSRAC-P was developed to observe behaviors in preschool settings and contained the following observational categories: (a) physical activity levels, (b) physical activity types, (c) locations, (d) indoor activity contexts, (e) outdoor activity contexts, (f) activity initiators, (g) group compositions, and (h) adult and peer prompts for physical activity. Observers use a focal-child momentary time-sampling procedure with 5-s observe and 25-s record intervals every 30 s. This yields two observation intervals per minute and 60 observation intervals per 30-min session. Observations are coded using INTMAN software (Tapp & Wehby, 2000) on handheld computers. In our coding system, the highest level of physical activity during the 5-s observe period is coded, and all accompanying observational information is recorded with reference to the highest activity level. The accompanying codes are recorded after physical activity level in the order presented in the Appendix. In this system, each category is mutually exclusive, and only one code per category is allowable for each interval.

During the initial refinement for the OSRAC-H, researchers retained relevant codes from the OSRAC-P. Informal environmental observations were then conducted in three homes to identify additional codes that were needed to capture potential contextual information specific to homes. After additions and modifications to the observational protocol, the first version of the OSRAC-H was field tested. Two observers, previously trained on the OSRAC-P system, completed several booster sessions prior to observing in children's homes. The purpose of these booster sessions was to examine interobserver agreement on the retained observational categories, especially physical activity level and group composition, while at the same time preparing the observers for subsequent home observations.

The final version of the OSRAC-H differs from the OSRAC-P in that it contains specific indoor and outdoor activity context codes relevant to homes. The OSRAC-H includes codes in two additional categories: (a) engagement, to assess parent and peer engagement in children's activities; and (b) television (TV) use, to determine whether the TV was on during home activities. A complete list of the categories and codes in the OSRAC-H is available in the Appendix.

To obtain data on children's physical activity and related contextual variables using the OSRAC-H, families were recruited from a variety of socioeconomic and geographic strata. All families gave their informed consent, and the institutional review board at the University of South Carolina approved the study and consent procedures.

Procedure

Thirteen children were observed in their homes on three occasions for 1.5 hr each. Three visits were conducted in order to observe and describe patterns of behavior across several days. During each home visit, three 30-min observations were completed. Home visits took place on two weeknights between 5:00 p.m. and 8:00 p.m. and one Saturday between 9:00 a.m. and 2:00 p.m. Children were observed for nine observations, totaling 4.5 hr per child. Data were collected according to the families' availability, and scheduled times may have included dinner or lunch observations; however, no observations were conducted while children were preparing for bed (e.g., bathing, changing clothes).

Data Analysis

The percentage of intervals in which codes in each category was recorded was determined and is reported below. Additional analyses were conducted to examine the percentage of intervals coded at certain activity levels for specific social or environmental contexts, including TV use, indoor and outdoor contexts, and engagement. To demonstrate the sensitivity of the system, the single most active child and the single least active child were identified, and their data are presented. Figures show the percentage of intervals spent in sedentary, light, and moderate-to-vigorous physical activity (MVPA) by activity type, indoor context and outdoor context for both of these children as well as for the total sample.

Agreement Analyses

To assess interobserver agreement, two independent observers simultaneously and independently coded during one visit for each family. Interobserver agreement was assessed during 37 30-min observation sessions (2,220 observation intervals) or about 33% of all observation sessions (6,780 observation intervals).

Interobserver agreement data were evaluated using Cohen's kappa coefficients and interval-by-interval agreement percentages (Landis & Koch, 1977). Both of these values are presented because of the nature of the system. Whereas kappa coefficients provide an accurate index of the reliability of the data by taking into account chance levels of agreement, percentage agreement is also presented because the distributions of codes within categories were often not equal, and this factor is important for calculating kappa (Watkins & Pacheco, 2000). Interval-by-interval agreement is presented based on the observation session: The total number of agreements within a category was divided by the sum of agreements and disagreements for that category, and this ratio was converted to a percentage. Agreement was defined as two observers coding the same code within a category for a given observation interval. Disagreement was defined as the two observers coding different codes within a category for a given observation interval.

RESULTS

The 13 families in our sample represented different socioeconomic and geographic strata (i.e., rural and urban). The children's mean age was 4.5 ± 0.9 years, and the sample was 54% boys. Forty-six percent were Caucasian ($n = 6$), 38% were African-American ($n = 5$), and the remaining 15% were Asian or Pacific Islander ($n = 2$).

Cohen's kappa coefficients and interval-by-interval interobserver agreement score means, standard deviations, and ranges for each of the 10 OSRAC-H categories are presented in Table 1. The resultant kappa coefficients indicate moderate to good interobserver agreement in most categories, with a few exceptions. Lower kappa coefficients (i.e., $< .60$) were obtained for activity initiator and prompt categories. Relatively lower coefficients were due to the extremely rare occurrence of codes within these categories. All of the interval-by-interval agreement scores were above 80%, indicating a relatively high percentage of agreement within observational categories.

In addition to illustrating the physical activity behaviors of the total sample and to better illustrate the ability of the system to describe differences between individual children, the most active and least active children were identified. Figure 1 depicts the physical activity levels of the 13 children at home (total sample) and the activity levels of these 2 children. Slightly more than 66% of observed intervals for the total sample were coded as either Level 1 (stationary) or Level 2 (stationary with limb or trunk movement); these are indicative of sedentary behavior. About 23% of the recorded intervals were recorded as Level 3 (slow, easy movement), representing light-intensity activities such as slow walking. Moderate-intensity

Table 1
Interobserver Agreement Scores for Pilot Sample (37 Sessions)

		Overall *M*	*SD*	Min	Max
Activity level	Kappa	.78	.08	.49	.94
	A/(A+D)	88%	4%	75%	97%
Activity type	Kappa	.89	.05	.76	1
	A/(A+D)	93%	4%	85%	100%
Location	Kappa	.96	.1	.1	1
	A/(A+D)	99%	3%	42%	100%
Indoor context	Kappa	.9	.09	.1	1
	A/(A+D)	95%	5%	53%	100%
Outdoor context	Kappa	.96	.06	.74	1
	A/(A+D)	99%	2%	92%	100%
Activity initiator	Kappa	.58	.29	0	1
	A/(A+D)	94%	7%	55%	100%
Group composition	Kappa	.83	.12	.23	1
	A/(A+D)	92%	6%	80%	100%
Prompts	Kappa	.58	.35	0	1
	A/(A+D)	99%	3%	83%	100%
Engagement	Kappa	.81	.168	0	1
	A/(A+D)	93%	6%	73%	100%
TV use	Kappa	.72	.18	0	1
	A/(A+D)	94%	7%	40%	100%

Note. A/(A+D) is total number of agreements divided by the total number of agreements plus disagreements.

activities were coded for slightly more than 2.4% of the recorded intervals, as indicated by an activity Level 4 (moderate movement), and slightly more than 4.7% of intervals were recorded as Level 5 (fast movement), indicating vigorous activity. Levels 4 and 5 were combined to represent MVPA (7.1% of intervals). For the most active child, 28.6% of all intervals were coded as light activity and 16.5% were coded as MVPA, whereas the least active child had 13% of intervals coded as light activity and 1.9% coded as MVPA.

Figure 2 presents the proportion of intervals coded as sedentary, light, or MVPA by physical activity type for the most active child, least active child, and total sample. Each panel represents the range of activity intensities performed within each code. To better illustrate the number of intervals represented and the intensity of activities performed for the most active and least active children, the y axes are the same for those panels. For type of activity, several codes were inherently restricted to allow only Levels 1 and 2 (sit or squat, stand), whereas others could represent a range of levels for movement (e.g., jump or skip, climb, ride). Alternatively, when a child was running, the physical activity level was always coded as Level 5 (fast movement). In general, the majority of the activity types represented were sedentary in nature. As the figure shows, very few intervals were coded as MVPA for the total sample. The least active child spent many more intervals in lie down, sit or squat, and stand activities than did the most active child. In comparison, the most active child had 72 observation intervals coded as MVPA, and the least active child had only 10 observation intervals coded as MVPA. The most active child also engaged in more types of activities than the least active child.

The indoor and outdoor activity contexts are mutually exclusive, in that if indoor was coded for location, only indoor contexts can be coded; the outdoor activity context was coded as not applicable and vice versa. As shown in Figure 3, physical activity levels for the total sample during indoors were mostly sedentary. The activity contexts that were associated with more intervals of light activity and MVPA were chores, transition, rough and tumble, and gross motor. The least active child spent many more observation intervals participating in indoor

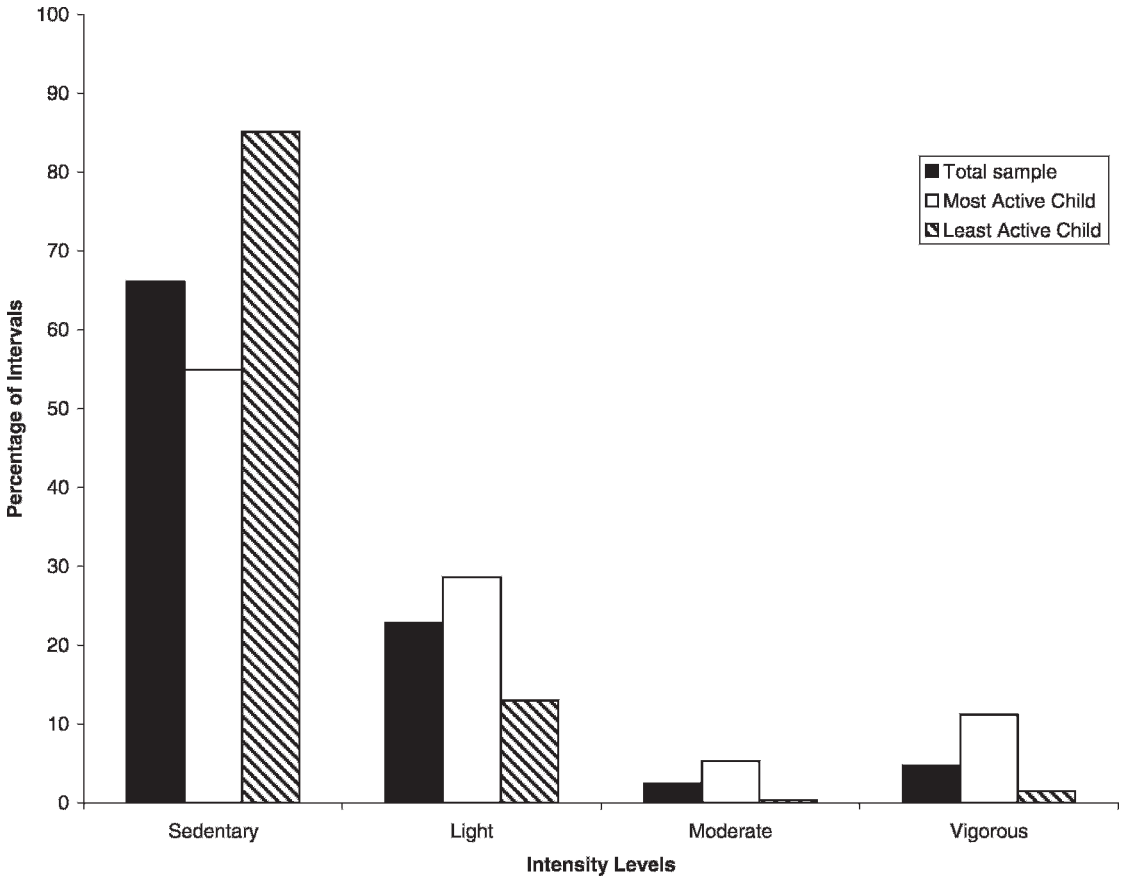

Figure 1. Percentage of intervals spent in sedentary, light, moderate, and vigorous physical activity for the total sample, the most active child, and the least active child.

activities than the most active child (470 and 281 observational intervals, respectively). Although indoor activities were generally sedentary for both children, the least active child spent more intervals in sedentary activities. Specifically, the least active child participated in many more intervals of TV watching and snacks than the most active child.

When children were outside (Figure 4), a higher proportion of intervals were coded as light activity or MVPA for the total sample. The outdoor activity contexts associated with more intervals of light activity and MVPA include open space, pets, games, and ball or object play. The least active child was observed in outdoor activity contexts for many fewer intervals than the most active child (57 and 157 observation intervals, respectively). When outdoors, the least active child was observed in MVPA during fewer intervals than the most active child (6 and 42 observational intervals, respectively). Children were not observed in all contexts. For example, the least active child did not participate in any ball or object play, whereas the most active child participated mostly in ball or object play when outdoors.

Engagement was defined as participation by adults, siblings, or peers in the same activity in which focus children were participating during an interval. Parents, siblings, and peers were not engaged with the children during 58% of the intervals observed. Adults were engaged with the children during 13% of the recorded intervals, whereas peers were engaged with them

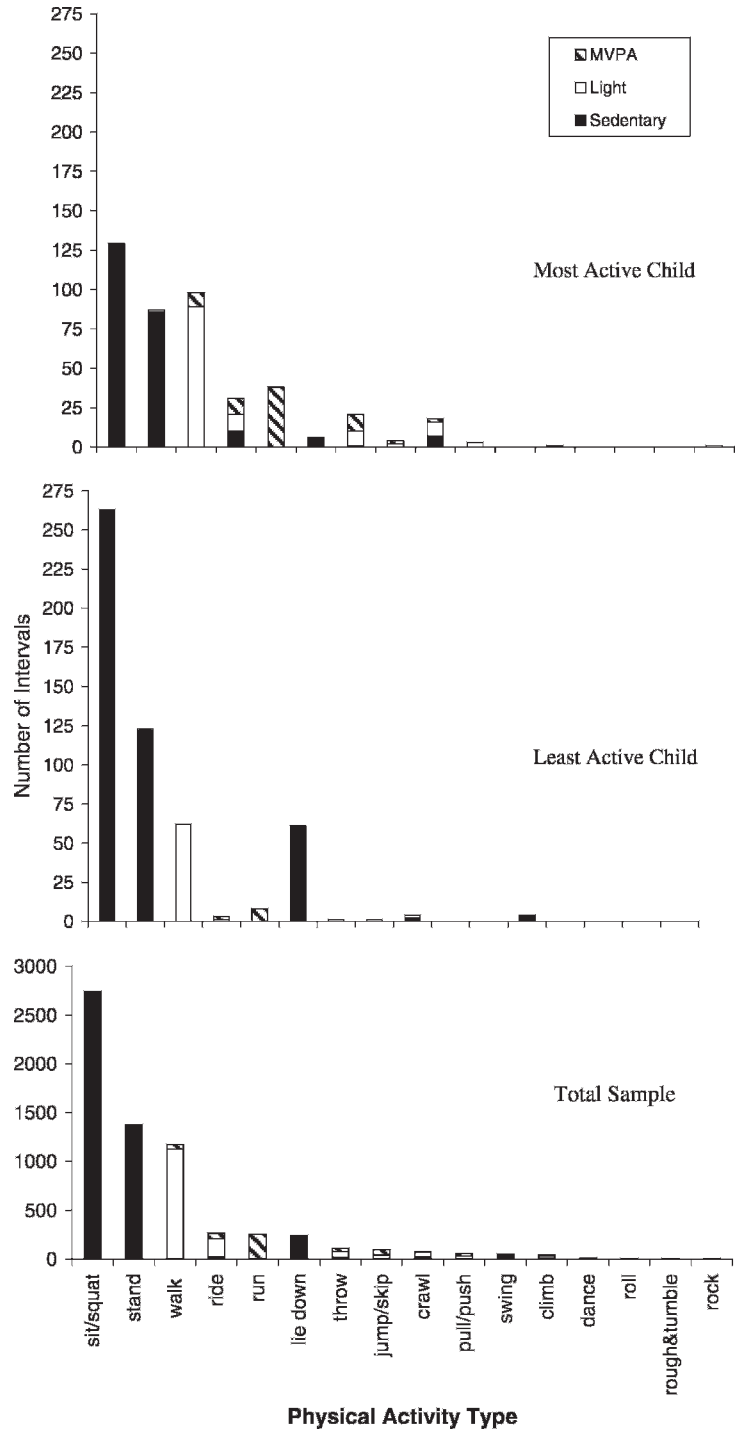

Figure 2. Proportion of intervals coded as sedentary, light, and moderate-to-vigorous physical activity by physical activity type for the most active child (top), the least active child (middle), and the total sample (bottom).

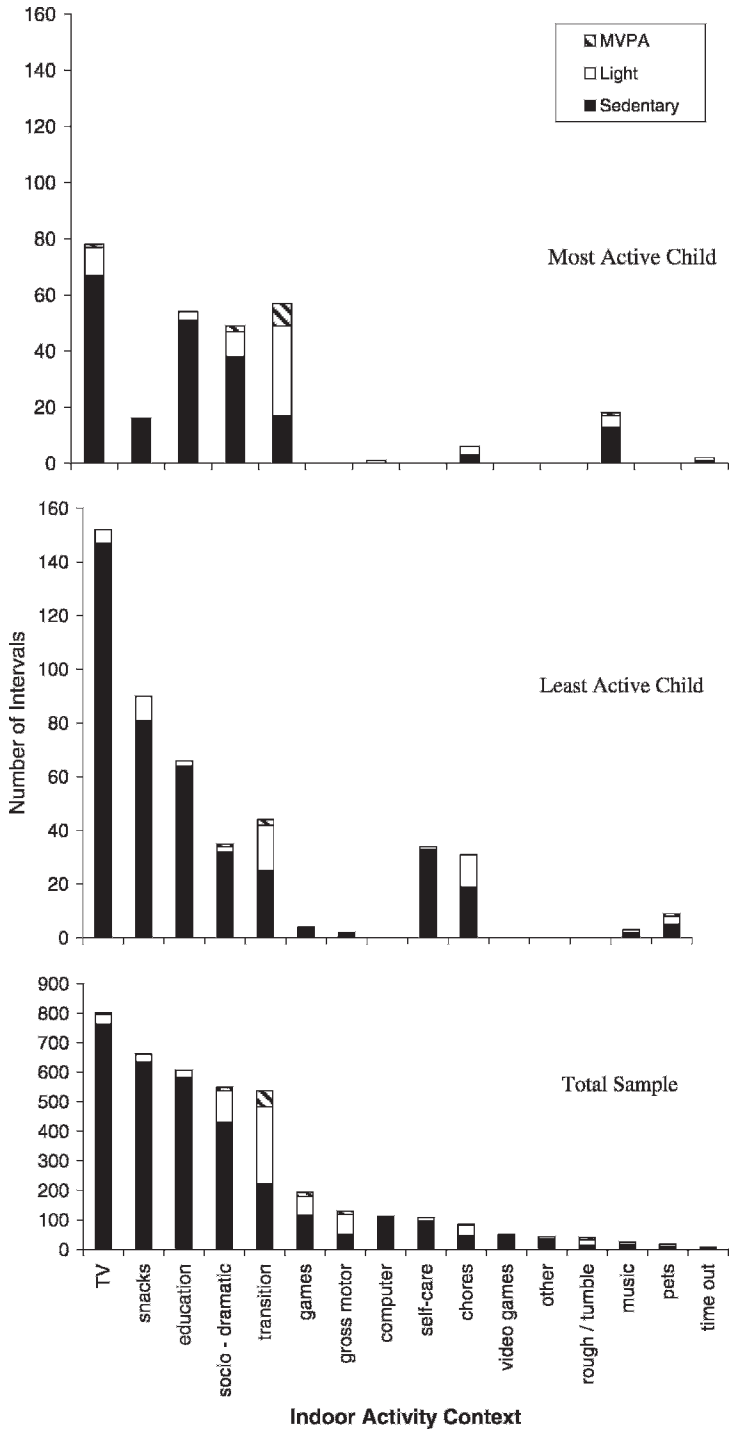

Figure 3. Proportion of intervals coded as sedentary, light, and moderate-to-vigorous physical activity by indoor activity context for the most active child (top), the least active child (middle), and the total sample (bottom).

during 17% of the intervals. During 11% of the recorded intervals, both adults and peers were engaged in the activity with the children. Statistically, when children were indoors, their physical activity levels were significantly lower when other persons (i.e., parents, siblings, peers, or some combination) were engaged in the activity with them compared to when they were involved in a solitary activity ($p = .0008$; data not shown). When children were outdoors, differences in their activity levels were not evident during engagement or no engagement.

DISCUSSION

In this paper, we described the development of the OSRAC-H and provided results from an application of the assessment. The OSRAC-H was developed using the OSRAC-P core categories and codes (Brown et al., 2006) with additional categories and codes specific to common indoor and outdoor activity contexts in homes being integrated into the modified observational system. The OSRAC-H provides researchers with a contemporary system that can be used with customized software programs (e.g., Tapp & Wehby, 2000) to record children's physical activity in their homes. Specifically, it provides additional contextual information on indoor and outdoor activity contexts in the home setting; TV use; and engagement with parents, siblings, and peers. Hence, the OSRAC-H represents a relatively comprehensive measurement method that is specific to physical activity and accompanying contextual circumstances within homes. The system may be useful in future research as either a primary observational tool or as part of a multimethod assessment of young children's physical activity.

The secondary aim of this paper was to provide preliminary and illustrative information on the physical activity of children in their homes in our pilot sample. Our data indicated that the majority of children's time was spent in sedentary activities. While indoors, children spent 25% of their time involved in screen-time activities such as TV watching, playing video games, and using the computer. When outdoors, children tended to be more physically active than when they were indoors, and they spent a larger proportion of the observed intervals in MVPA while riding wheeled toys, playing in open spaces, and using balls and other gross motor toys.

Future users of the OSRAC-H will be able to link moment-to-moment social and environmental contextual information to children's physical activity in their homes. The information gained from observations can assist researchers in determining the specific contexts and the circumstances related to those contexts, in which children are most active as well as those in which they are least active. The OSRAC-H was used in the current study to describe physical activity in children at home and identified different individual activity patterns for each child observed. To date, we have employed the observational system (i.e., OSRAC-P) in a single pilot study (Brown, 2006). Nevertheless, the system demonstrated its usefulness in measuring differences in children's physical activity levels when they participated in teacher-implemented interventions compared to their routine outdoor activities on preschool playgrounds. We also believe that the observational system will be useful in monitoring intervention implementation (e.g., adult-implemented physical activities, prompts for activity) as well as determining physical activity before and following intervention. The OSRAC-H system described different activity patterns for 2 of the children from our sample. Future research should determine if aggregating more data across longer periods of time elucidates meaningful differences in young children's physical activity.

The OSRAC-H can be used as both a process and outcome evaluation tool with interventions.

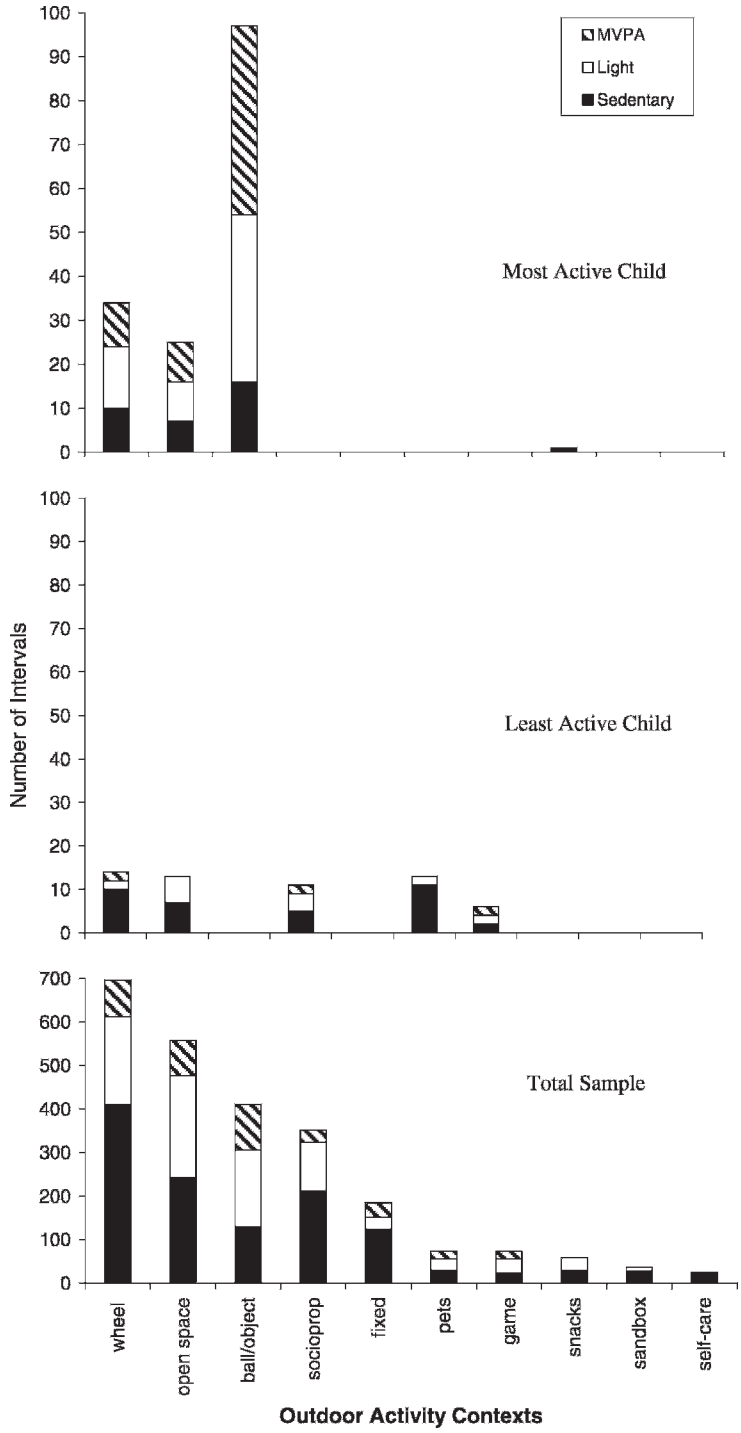

Figure 4. Proportion of intervals coded as sedentary, light, and moderate-to-vigorous physical activity by outdoor activity context for the most active child (top), the least active child (middle), and the total sample (bottom).

For example, from our pilot data, we determined that boys were less active with TVs on than with TVs off, even if they were not engaged in watching TV (data not shown). The data indicate that with TVs off, children might be more likely to choose physical activity or educational pursuits inside, including playing with manipulative or gross motor toys. A potential intervention component to reduce children's screen time and increase their MVPA might include restricting TV and other screen-time activities. The OSRAC-H could be used to describe any changes from sedentary activity contexts to more active contexts and any altered patterns of children's physical activity levels following the reduction of TV use in homes. Another potential intervention could include increasing time spent outdoors with accompanying parental involvement in and encouragement of children's physical activity. The OSRAC-H system could be used not only to document a change in time spent indoors and outdoors but also to document any parental encouragement of and engagement in children's physical activity.

Based on our pilot study and the resulting interobserver agreement information gathered, the OSRAC-H appears to be a reliable, multicategorical direct-observation assessment that may be useful in home settings; however, several aspects of the system warrant further discussion before its adoption. First, similar to many complex observational systems, extensive training with the system is necessary before it can be used as a reliable measurement tool in the field. Data collectors in this study underwent an intensive 8-week training period on the OSRAC-P, which included written tests on the categories and codes, observational training sessions with videotapes and in situ, and interobserver agreement sessions with a gold-standard observer (i.e., previously well-trained researcher). Observers had extensive experience in live observation coding (over 150 hr) using the OSRAC-P system and completed approximately 20 hr of booster training sessions prior to the start of this pilot study. Second, observer agreement estimates may be influenced greatly by the rate of occurrence or nonoccurrence of behavior; in this case, occurrence and nonoccurence are specific to physical activity levels and the accompanying codes associated with those behaviors. The extremely low frequency of codes in certain categories (e.g., activity initiator, prompts) led to kappa coefficients below .60. We acknowledge the limitation of kappa for representing interobserver agreement with rare behavioral events and included interval-by-interval percentage agreement as an additional method to estimate interobserver agreement. From our preliminary efforts, we believe that when observers are well trained, they may easily learn to employ both the OSRAC-P and OSRAC-H systems, with the coding differences being obvious for preschool and home settings.

The OSRAC-H is a relatively comprehensive tool with its categories and codes for physical activity types, contexts, engagement, and TV use. Nevertheless, similar to many other direct-observation measures, the OSRAC-H is not without its limitations. First, like most previously developed observation systems, concurrent validity information is not presently available. Comparison of the observation data with another objective measure of physical activity (e.g., accelerometer data) might provide information that is useful in validating physical activity levels as determined by direct observation. Second, the contexts contained in the OSRAC-H are specific to children's homes and their immediate home surroundings. This was the intent of our pilot research, but if one wanted to observe the physical activity of children across extended neighborhood or community contexts (e.g., elementary schools, community-based recreational programs, parks and playgrounds), another broader system with additional contextual codes will be necessary. Third, whereas the system contains a category and codes for adult and peer activity prompts, a

specific separate code for responses to a prompt is not defined in the current system. Hence, researchers who are interested in information related to immediate effects of prompting will need to establish a category with accompanying codes to measure any potential responses.

A fourth potential limitation of many contemporary observation systems is that real-time information is not available for behaviors or the contextual circumstances of the behaviors of interest. The OSRAC-H system employs a 5-s observe and 25-s record momentary time-sampling procedure. Although the INTMAN software allows customization of the observe and record interval lengths, observing multiple behaviors for longer periods of time or in real time may introduce additional error in observers' abilities to collect reliable information due to children's rapid changes in activity types, levels, and circumstances (Brown et al., 2006). Nevertheless, we believe that observing relatively short periods of time frequently and for multiple 30-min sessions allowed us to capture reliable physical activity and accompanying contextual information. Indeed, time-sampling procedures have been employed frequently and effectively in numerious direct-observation studies (Hanley, Cammilleri, Tiger, & Ingvarsson, 2007; cf. Brown, Odom, Li, & Zercher, 1999; Hartmann & Wood, 1990). Nevertheless, in the future, with similar complex observational systems, researchers may want to carefully evaluate the extent to which relatively short sampling intervals can be lengthened to capture children's behavior while maintaining accurate assessment of the behaviors of interest.

Finally, our prelimary study with the OSRAC-H, although stratified by socioeconomic and geographic status, employed a very small sample of 3- to 6-year-old children in their homes. The activity contexts developed in this age group may not always be relevant for older children, particularly adolescents. Our relatively small sample limits the generalizability of the results to the general population of young children's homes. However, we do believe that the sample was adequate to demonstrate the fundamental measurement properties (e.g., interobserver agreement and sensitivity to individual child differences) of the OSRAC-H and show its feasibility and applicability for use in children's homes.

Children's physical activity data obtained from direct-observation studies conducted in homes is important in guiding the development and evaluation of effective interventions to increase children's MVPA and to decrease their excessive sedentary behaviors (Brown et al., 2006; Pate, 2001). Important descriptive information may be systematically collected concerning children's preferences for physical activities and the level of parental and sibling assistance needed to enhance children's healthy lifestyles. In addition, given that screen-time estimates are often misreported by parents' and children's self-reports, the OSRAC-H makes possible the objective determination of screen-time use. Whereas the results of this study are correlational, we believe that manipulation of some of the contexts associated with both lower and higher levels of physical activity may assist researchers in identifying arrangements that are conducive to higher physical activity levels for young children. In the future, our direct-observation system and similar assessments may be used to evaluate the effectiveness of interventions that are aimed at a variety of strategies for enhancing children's physical activity. These strategies could include reducing overall screen time, encouraging parental involvement in and support of MVPA, and providing equipment and activities to promote healthier lifestyles. As with many direct-observation systems, we anticipate that other investigators will adapt and enhance the measurement protocol to better meet their specific research needs. Nevertheless, we believe that the OSRAC-H (and its core behavioral, social, and environmental dimensions that are related to potential influences on children's physical acti-

vity behaviors in their homes) is an important addition to the measurement of young children's physical activity.

REFERENCES

Baranowski, T., Thompson, W. O., DuRant, R. H., Baranowski, J., & Puhl, J. (1992). Observations on physical activity in physical locations: Age, gender, ethnicity, and months effects. *Research Quarterly for Exercise Science*, *64*, 127–133.

Bijou, S. W., Peterson, R. F., & Ault, M. H. (1968). A method to integrate descriptive and experimental field studies at the level of data and empirical concepts. *Journal of Applied Behavior Analysis*, *1*, 175–200.

Brown, W. H. (2006, February). *Teacher-implemented interventions to enhance young children's physical activity in preschools*. Poster session presented at the fifth biennial Conference on Research Innovations in Early Intervention, San Diego, CA.

Brown, W. H., Odom, S. L., Li, S., & Zercher, C. (1999). Ecobehavioral assessment in early childhood programs: A portrait of preschool inclusion. *Journal of Special Education*, *33*, 138–153.

Brown, W. H., Pfeiffer, K., McIver, K. L., Dowda, M., Almeida, J., & Pate, R. (2006). Assessing preschool children's physical activity: An Observational System for Recording Physical Activity in Children–Preschool Version (OSRAC-P). *Research Quarterly for Exercise and Sport*, *77*, 167–176.

Dennison, B. A., Erb, T. A., & Jenkins, P. L. (2002). Television viewing and television in bedroom associated with overweight risk among low-income preschool children. *Pediatrics*, *109*, 1028–1035.

DuRant, R. H., Baranowski, T., Puhl, J., Rhodes, T., Davis, H., Greaves, K. A., et al. (1993). Evaluation of the Children's Activity Rating Scale (CARS) in young children. *Medicine and Science in Sports and Exercise*, *25*, 1415–1421.

Epstein, L. H., Paluch, R. A., Gordy, C. C., & Dorn, J. (2000). Decreasing sedentary behaviors in treating pediatric obesity. *Archives of Pediatric and Adolescent Medicine*, *154*, 220–226.

Finn, K. J., & Specker, B. (2000). Comparison of actiwatch activity monitor and Children's Activity Rating Scale in children. *Medicine and Science in Sports and Exercise*, *32*, 1794–1797.

Fulton, J. E., Burgeson, C. R., Perry, G. R., Sherry, B., Galuska, D. A., Alexander, M. P., et al. (2001). Assessment of physical activity and sedentary behavior in preschool-age children: Priorities for research. *Pediatric Exercise Science*, *13*, 113–126.

Gortmaker, S. L., Must, A., Sobol, A. M., Peterson, K., Colditz, G. A., & Dietz, W. H. (1996). Television viewing as a cause of increasing obesity among children in the United States, 1986–1990. *Archives of Pediatric and Adolescent Medicine*, *150*, 356–362.

Hanley, G. P., Cammilleri, A. P., Tiger, J. H., & Ingvarsson, E. T. (2007). A method for describing preschoolers' activity preferences. *Journal of Applied Behavior Analysis*, *40*, 603–618.

Hartmann, D. P., & Wood, D. D. (1990). Observational methods. In A. S. Bellack, M. Hersen, & A. E. Kazdin (Eds.), *International handbook of behavior modification and therapy* (pp. 107–138). New York: Plenum.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, *33*, 159–174.

McKenzie, T. L., Marshall, M. A., Sallis, J. F., & Conway, T. L. (2000). Leisure-time physical activity in school environments: An observational study using SOPLAY. *Preventive Medicine*, *30*, 70–77.

McKenzie, T. L., Sallis, J. F., Patterson, T. L., Elder, J. P., Berry, C. C., Rupp, J. W., et al. (1991). BEACHES: An observational system for assessing children's eating and physical activity behaviors and associated events. *Journal of Applied Behavior Analysis*, *24*, 141–151.

Nader, P. R., O'Brien, M., Houts, R., Bradley, R., Belsky, J., Crosnoe, R., et al. (2006). Identifying risk for obesity in early childhood. *Pediatrics*, *118*, 594–601.

Ogden, C. L., Caroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2006). Prevalence of overweight and obesity in the United States, 1999–2004. *Journal of the American Medical Association*, *295*, 1549–1555.

Pate, R. R. (2001). Assessment of physical activity and sedentary behavior in preschool children: Priorities for research. *Pediatric Exercise Science*, *13*, 129–130.

Pate, R. R., Pfeiffer, K. A., Trost, S. G., Ziegler, P., & Dowda, M. (2004). Physical activity in children attending preschools. *Pediatrics*, *114*, 1258–1263.

Sallis, J. F. (1991). Self-report measures of children's physical activity. *Journal of School Health*, *61*, 215–219.

Sirard, J. R., & Pate, R. R. (2001). Physical activity assessment in children and adolescents. *Sports Medicine*, *31*, 439–454.

Tapp, J., & Wehby, J. (2000). Observational software for laptop computers and optical bar code time wands. In T. Thompson, D. Felce, & F. Symons (Eds.), *Behavioral observation: Technology and applications in developmental disabilities* (pp. 71–82). Baltimore: Brookes.

Watkins, M. W., & Pacheco, M. (2000). Interobserver agreement in behavioral research: Importance and calculation. *Journal of Behavioral Education*, *10*, 205–212.

Received February 14, 2007
Final acceptance November 20, 2007
Action Editor, Gregory Hanley

APPENDIX

Observational Categories, Accompanying Codes, and Brief Descriptions for the OSRAC-H

Activity level codes	
Stationary or motionless	Stationary or motionless with no major limb movement or major joint movement (e.g., sleeping, standing, riding passively in a wagon)
Stationary with limb or trunk movements	Stationary with easy movement of limb(s) or trunk without translocation (e.g., standing up, holding a moderately heavy object, hanging off of bars)
Slow, easy movements	Translocation at a slow and easy pace (e.g., walking with translocation of both feet, slow and easy cycling, swinging without assistance and without leg kicks)
Moderate movements	Translocation at a moderate pace (e.g., walking uphill, two repetitions of skipping or jumping, climbing on monkey bars, hanging from bar with legs swinging)
Fast movements	Translocation at a fast or very fast pace (e.g., running, walking upstairs, three repetitions of skipping or jumping, translocation across monkey bars with hands while hanging)
Activity type codes	
Climb	Climbing, hanging
Crawl	Crawling
Dance	Dancing, expressive movement
Jump or skip	Jumping, skipping, hopping, galloping
Lie down	Lying down
Pull or push	Pulling or pushing an object or child
Rough and tumble	Rough and tumble play such as wrestling or play fighting
Ride	Cycling, skateboarding, roller skating, scooter
Rock	Rocking on a teeter totter or on a horse
Roll	Rolling
Run	Running
Sit or squat	Sitting, squatting, kneeling
Stand	Standing
Swim	Swimming or playing in a pool
Swing	Swinging on a swing
Throw	Throwing, kicking, catching
Walk	Walking, marching
Other	Physical activity type other than the options listed above
Location codes	
Inside	Being inside the house
Outside	Being outside the house
Transition	Moving between the inside and outside of the house
Indoor activity context codes[a]	
Computer	Engaging in computer activities including entertainment or educational games or internet use
Education	Engaging in educational activities; art activities; or playing with puzzles, blocks, and so on.
Games	Engaging in formal games such as board games, made-up games with rules, or sports games indoors
Gross motor	Engaging in large motor activities such as dancing, marching, jumping, gymnastics, karate, and so on
Housework or chores	Engaging in housework or chores that are adult directed
Music	Engaging in activities focused on music such as singing or playing instruments, listening to music
Parent arranged	Engaging in a formal gross motor activity that has been planned, arranged, and is led by an adult
Pets	Engaging in pet care or playing with a family pet
Rough and tumble	Engaging in rough housing or wrestling, engaging in action-style games
Self-care	Engaging in self-care activities including toileting, washing hands, dressing, brushing teeth

APPENDIX
(Continued)

Snacks	Preparing, eating, or cleaning up food during mealtime
Sociodramatic	Engaging in activities with materials and props for pretend play or make-believe roles
Time-out	Child is placed in solitary time-out for disciplinary reasons
Transitions	Child is moving from one activity to another, wandering
TV or videos	Watching TV or a video on a TV
Video games	Playing or watching other play a handheld video game or games on a video game system
Other	Engaging in another indoor activity not listed
Outdoor activity context codes[a]	
Ball or object	Engaging in activities with objects used for gross motor activities (e.g., balls, throwing toys, jump ropes)
Fixed equipment	Engaging in activity on fixed playground equipment (e.g., swing set, playhouse, tree house)
Game	Participating in a game with rules (e.g., tag games, basketball, soccer)
Open space	Being in an open outdoor space and not involved in a specific activity
Outside chores	Engaging in outside chores that are adult directed (e.g., sweeping, picking up toys, taking out trash)
Parent arranged	Engaging in a formal gross motor activity that has been planned, arranged, and is led by an adult
Pets	Engaging in pet care or playing with a family pet
Pool	Being in and around a pool or involved in other water play (slip-n-slide, sprinklers)
Portable	Using equipment brought by adults or peers to yard or other outdoor area (not fixed, wheels, or balls)
Rough and tumble	Engaging in rough housing or wrestling
Sandbox	Being in a sandbox or a designated area for sandbox digging activities, does not include gardening
Self-care	Engaging in self-care activities including toileting, washing hands, dressing, brushing teeth
Snacks	Preparing, eating, or cleaning up food during mealtime
Socioprops	Engaging in play with small sociodramatic play props that are brought outdoors (cars, dolls, etc.)
Time-out	Child is placed in time-out for disciplinary reasons
Video games	Playing or watching others play a handheld video game
Wheel	Riding or pushing wheeled toys that are not part of fixed equipment
Other	Engaged in another outdoor activity not listed
Activity initiator codes	
Adult	The activity in which the child is involved was directed by an adult
Child	The activity in which the child is involved was selected by a child
Group composition codes	
Solitary	Engaging in a solitary activity and not in proximity to peers or adults
One-to-one adult	Engaging in an activity with or in proximity to an adult
One-to-one peer	Engaging in an activity with or in proximity to a peer
Group adult	Engaging in an activity with or in proximity to peers and an adult
Group child	Engaging in an activity with or in proximity to peers without an adult
Prompt codes	
No prompt for activity	Adults or peers did not explicitly prompt the focal child to increase or decrease physical activity or a prompt is unrelated to physical activity
Adult prompt to increase activity	Adult explicitly prompted the child to engage in or maintain physical activity
Adult prompt to decrease activity	Adult explicitly prompted the child to stop or decrease physical activity
Peer prompt to increase activity	Peer explicitly prompted the child to engage in or maintain physical activity
Peer prompt to decrease activity	Peer explicitly prompted the child to stop or decrease physical activity

APPENDIX
(Continued)

Engagement codes[a]	
None	Adults or peers are not engaged in the activity in which the child is participating
Adult	Adult is actively engaged in the activity in which the child is participating and no peers are engaged
Peer	Peer is actively engaged in the activity in which the child is participating and no adults are engaged
Adult and peer	Adults and peers are actively engaged in the activity in which the child is participating
TV use codes[a]	
Off	The TV is off in the room in which the child is located
On	The TV is on in the room in which the child is located
Not applicable	There is no TV in the room in which the child is located or the child is outside

[a] Indicates changes or additions to the OSRAC-P.