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Assessing Preschool Children's Physical Activity: The Observational System for Recording Physical Activity in Children-Preschool Version

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In this paper we present initial information concerning a new direct observation system—the Observational System for Recording Physical Activity in Children-Preschool Version. The system will allow researchers to record young children's physical activity levels while also coding the topography of their physical activity, as well as detailed indoor and outdoor social and nonsocial contextual information. With respect to interobserver agreement (IOA), the kappa and category-by-category agreement mean of those obtained for the three illustrative preschools were generally above .80. Hence, our IOA data indicated that trained observers in the three preschools frequently agreed on the eight observational categories and accompanying codes. The results for preschoolers' level of physical activity indicated they spent the majority of observational intervals in sedentary activity (i.e., more than 80% intervals) and were observed in moderate to vigorous physical activity much less frequently (i.e., 5% or fewer intervals). For the 15 indoor and 12 outdoor activity contexts, variability across both the activity contexts and the three preschools were evident. Nevertheless, three classroom contexts—transition, snacks, and naptime—accounted for the greatest porportion of coded activity contexts for the children. In the three preschools, 4 of 17 physical activity types—sit and squat, lie down, stand, and walk—accounted for the topography of much of children's physical activity behavior. Systematic observation of more representative preschool samples might better inform our present understanding of young children's physical activity in community preschool programs.

Key words: direct observation, preschool assessment

During the last several decades, childhood obesity rates have increased dramatically, and children are becoming overweight at earlier ages (e.g., Ogden et al., 1997; Strauss, & Pollack, 2001; Troiano & Flegal, 1998). Obesity has been associated with multiple and severe health problems, most notably coronary heart disease, hypertension, and type II diabetes (e.g., Blair & Brodney, 1999; Must et al., 1999). Researchers have hypothesized that the increased frequency of obesity has been related to either dietary changes or decreases in physical activity or both (e.g., Troiano & Flegal, 1998; U.S. Department of Health and Human Services, 1996). Hence, public health professionals have argued for improvements in diet and exercise regimens for children and adults throughout the lifespan (e.g., *Healthy People 2010;* U.S. Department of Health and Human Services, 2000).

During the last four decades, the number of preschool-age children served in center-based programs has increased dramatically to well over 4.2 million, or about 56% of 3-, 4-, and 5-year-olds not enrolled in kindergarten (Federal Interagency Forum on Child and Family Statistics, 2004; Meisels & Shonkoff, 2000). Nonetheless, at present we have extremely limited information con-

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cerning young children's physical activity behaviors, particularly factors associated with their physical activity in preschools (cf. Fulton et al., 2001; Pate, 2001; Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004). Moreover, the existing data have been based on relatively small samples of preschoolers and provided restricted contextual information about the social and nonsocial environmental circumstances associated with young children's physical activity (e.g., Baranowski, Thompson, DuRant, Baranowski, & Puhl, 1993; McKenzie et al., 1991; McKenzie et al., 1997; Noland, Danner, DeWalt, McFadden, & Kotchen, 1990). Indeed, Sirard and Pate (2001) argued that accurate assessment of children's physical activity is necessary to: (a) determine the levels and types of physical activity, and (b) evaluate interventions for enhancing their physical activities in community-based settings.

The Observational System for Recording Physical Activity in Children-Preschool Version (OSRAC-P) provides researchers with two significant improvements over other existing direct observational systems for young children's physical activity. These are related to recording social and contextual conditions for and the behavioral topography of children's physical activity. First, expanding and refining the immediate indoor and outdoor, nonsocial activity contexts has differentiated the OSRAC-P from other high-quality direct observation systems, such as the Child Activity Rating Scale (CARS; Baranowski et al., 1993; Durant et al., 1993; Puhl et al., 1990), the Behaviors of Eating and Activity for Child Health Evaluation System (BEACHES; e.g., McKenzie et al., 1991; McKenzie et al., 1997), and System for Observing Play and Leisure Activity in Youth (SOPLAY; e.g., McKenzie, Marshall, Sallis, & Conway, 2000). For example, with the CARS, which served as a model for refining the OSRAC-P physical activity level codes, observers are not able to collect immediate contextual information about where and under what circumstances children perform physical activity. Similarly, with the use of the BEACHES or SOPLAY systems, observers can record only global environmental information, such as whether or not children are inside the school, a designated school play space, or the cafeteria. Moreover, the SOPLAY system is a group time sampling protocol that does not yield individual child data for analysis. With respect to immediate nonsocial environmental codes, the OSRAC-P has allowed observers to record as many as 15 preschool activity contexts within children's classrooms. These indoor activity contexts were adapted from the Code for Active Student Engagement Revised (CASPER-II) observational system that has been used in previous multisite, direct observational research in preschools (e.g., Brown, Odom, Li, & Zercher, 1999). In addition, the OSRAC-P development team established 12 codes for outdoor activity contexts commonly found on preschool playgrounds or in indoor gyms.

Second, developing a physical activity type category with 17 accompanying codes for specific forms of children's physical activity behavior represented another important innovation over other existing observation systems. For example, neither the CARS, BEACHES, nor SOPLAY allows observers to record the varied behavioral forms of young children's physical activity at different activity levels. The integration of physical activity type codes allows observers to indicate the specific topography of children's physical activity, such as running, walking, riding, sitting, and climbing.

Our purpose in this paper is to present the OSRAC-P. First, we describe the development of the OSRAC-P and its accompanying observational categories and codes. Next, we provide reliability information in the form of interobserver agreement measures for the children observed in three preschools, a child care center, a church-related preschool, and a Head Start Center. Then, we present preliminary direct observation data from the preschools to illustrate the potential uses of the OSRAC-P and its resultant data. Finally, we discuss how the OSRAC-P might be used to inform our understanding of preschool children's physical activity in future descriptive and intervention research related to early childhood practices and policies.

Development of and Observer Training With the OSRAC-P

Four investigators—three exercise science researchers and an early childhood investigator—who were knowledgeable about direct observation systems and young children's physical activity developed the OSRAC-P. We initially developed the OSRAC-P by systematically reviewing, selecting, developing when needed, revising as indicated, and then integrating relevant observational categories and codes from two existing direct observation systems for young children: (a) CARS (Baranowski et al., 1993; Durant et al., 1993; Puhl, Greaves, Hoyt, & Baranowski, 1990), and (b) CASPER-II (Brown et al., 1999). The CARS was chosen over other existing systems, because we believe that it better captures moderate-to-vigorous physical activity.

For data collection purposes, we used a momentary time sampling observation system with a 5-s observation interval with an accompanying 25-s coding interval for each focal child observed (i.e., 2 observations/min for 30 min of observation = 60 observational samples). In addition, we used an INTMAN software system (Tapp & Wehby, 2000) with hand-held Dell Axim X5 computers (Dell World Trade LP, Round Rock, TX) to collect and transfer field data into a computer database. Following the initial development, refinement, and integration

of the observational categories and codes, we extensively field tested the OSRAC-P with daily in situ observations across several weeks in two local preschools. During field testing, we further revised the OSRAC-P observational categories and codes as needed.

The OSRAC-P development process has yielded a direct observation system with eight observational categories and accompanying codes for recording children's physical activity behaviors and contextual information related to those behaviors. The OSRAC-P allows trained observers to record a focal child's level (e.g., fast, moderate, stationary) and topography (e.g., running, sitting, walking, riding) of physical activity behaviors while identifying the immediate social (i.e., initiator of activity, group composition, teacher or peer prompt for physical activity) and nonsocial environmental circumstances (i.e., child location, indoor activity contexts, outdoor activity contexts) associated with the child's activity. Observational categories with accompanying codes and brief descriptions are delineated in Table 1.

Following development of the OSRAC-P, four observers were trained to use the observational system in two preschools. We used an eight-step method recommended by Hartmann and Wood (1990) for observer training. The steps included: (a) informal pilot observations in preschools, (b) sensitization to young children's physical activity and direct observation issues, (c) learning the observational categories and accompanying codes, (d) written criterion tests for relevant observational categories and codes, (e) videotape coding prac-

Table 1. Observational categories, accompanying codes, and brief descriptions for the OSRAC-P

Activity level codes	Brief descriptions
1—stationary or motionless	Stationary or motionless with no major limb movement or major joint movements (e.g., sleeping, standing, riding passively in a wagon)
2—stationary w/ 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)
3—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)
4—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)
5—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/skip	Jumping, skipping, hopping, galloping
Lie down	Lying down
Pull/push	Pulling or pushing an object or child
Rough and tumble	Rough and tumble play such as wrestling play fighting
Ride	Cycling, skateboarding, roller skating, scooter
Rock	Rocking on a teeter totter or on a horse
Roll	Rolling
Run	Running
Sit/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 preschool building
Outside	Being outside the preschool building or in an indoor gymnasium
Transition	Lining up and waiting to move inside or outside or moving between two rooms within the building

Note. OSRAC-P = Observational System for Recording Physical Activity in Children-Preschool Version; PA = physical activity.
[Table 1 con. on p. 170.]

Table 1. [cont. from p. 169] Observational categories, accompanying codes, and brief descriptions for the OSRAC-P

Codes	Brief descriptions
Indoor activity context codes	
Art	Engaging in art activities or being in an art center or activity area
Preacademic	Engaging in preacademic activities (e.g., literacy, math, science) or being in a preacademic center
Gross motor	Engaging in gross motor activities or being in an activity area with gross motor equipment
Group time	Participating in a large group activity, with at least 50% of the children, that is teacher organized and led
Large blocks	Engaging in large block activities or being in a large block center or activity area
Manipulative	Engaging in fine motor activities (e.g., sensory tables) or being in a manipulatives center
Music	Engaging in music or being in a music center or activity area
Nap	Napping or resting or preparing for nap
Self-care	Engaging in self care activities or being in a self-care area (bathroom, sink)
Snacks	Preparing, eating, or cleaning up food during mealtime or being in an eating area
Sociodramatic	Engaging in sociodramatic or pretend play activities or being in a sociodramatic play center
Teacher arranged	Engaging in teacher planned, arranged, and led gross motor physical activities with or without equipment
Time out	Child is placed in solitary time-out for disciplinary reasons
Transition	Moving from one classroom activity context to another area without engaging materials
Videos	Engaging in activities with computers, TVs, or videos or being at a computer, TV, or video center
Other	Being in some other indoor context or engaging in some activity other than the options listed above
Outdoor activity context codes	
Ball and object play	Engaging in activity with objects used for gross motor activities (e.g., balls, throwing toys)
Fixed equipment	Engaging in activity on fixed playground equipment or being on fixed playground equipment
Games	Participating in a well-known preschool game such as Duck-Duck-Goose, Red Rover, or Freeze Tag
Open space	Being in an open outdoor area that is not one of the other outdoor activity contexts
Pool activities	Being in a pool or playing with water play toys in a water area
Portable equipment	Engaging in activity with equipment brought to the playground or gym other than balls or wheel toys
Sandbox	Engaging in activities using sandbox materials or being in a sandbox
Snacks	Preparing, eating, or cleaning up food during mealtime or being in an outside eating area
Sociodramatic props	Engaging in activity with sociodramatic play props or similar materials outdoors or in a gym
Teacher arranged	Engaging in teacher planned, arranged, and led gross motor activities with or without equipment
Time out	Child is placed in solitary time-out for disciplinary reasons
Wheel	Touching, riding, or pushing wheel toys that are not fixed equipment (e.g., tricycles, scooters, wagons)
Other	Outdoor or gym activity context other than the options listed above
Activity initiator codes	
Adult	The activity area or the activity in which the focal child is observed was selected or started by an adult
Child	The activity area or the activity in which the focal child is observed 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 only an adult or being in an activity area with only an adult
One-to-one peer	Engaging in an activity with or in proximity to a peer or being in an activity area with a peer
Group adult	Engaging in an activity with or in proximity to peers and an adult or in an activity area with them
Group child	Engaging in an activity with or in proximity to peers without an adult or being in an activity area with peers without an adult
Prompt codes	
No prompt for PA	Teacher did not explicitly prompt the focal child to increase or decrease physical activity or the teacher's prompt is unrelated to physical activity
Teacher prompt to increase PA	Teacher explicitly prompted the focal child to engage in or maintain physical activity
Teacher prompt to decrease PA	Teacher explicitly prompted the focal child to stop or decrease physical activity
Peer prompt to increase PA	Peer explicitly prompted the focal child to engage in or maintain physical activity
Peer prompt to decrease PA	Peer explicitly prompted the focal child to stop or decrease physical activity

Note. OSRAC-P = Observational System for Recording Physical Activity in Children-Preschool Version; PA = physical activity.

tice of children's physical activity in preschools, (f) extensive in situ coding practice in preschools, (g) regular postobservation debriefings during the investigation, and (h) retraining as needed throughout preschool observations. Observers were trained to an 80% interval-by-interval agreement criterion for each category across 3 consecutive days prior to initiating observations. Initial training required 7 weeks of intensive and daily in situ practice and coding. The OSRAC-P allows us to collect, catalog, and store observational data for the eight behavioral and environmental categories in a database. In addition, the INTMAN software system promotes the collection and analysis of interobserver agreement information. Auditory cues in the program facilitated accurate simultaneous observing and information coding for each 5-s observation interval.

Interobserver Agreement Measures for the OSRAC-P

While collecting direct observation data for community-based investigations, regular interobserver agreement (IOA) assessment across critical observation facets (e.g., children, days, settings, circumstances within settings, observers) is necessary to ensure observers reliably code behavioral and environmental events (cf. Hartmann & Wood, 1990). During collection of OSRAC-P information in the preschools, we regularly collected and analyzed IOA measures of about 13% of the observations across observers, children, days, settings, and circumstances within settings. The kappa and category-by-category IOA score means, standard deviations, and ranges for each of the OSRAC-P categories from three preschools are delineated in Table 2.

As shown in Table 2, the kappa and category-by-category agreement means obtained for the three preschools were generally above .80, and the means of the means for the three preschools were also above .80, except for group composition (i.e., mean of means kappa = .79). Hence, our IOA data indicated that observers who independently and simultaneously recorded focal children's physical activity behavior and accompanying social and nonsocial contextual information frequently

Table 2. Means, standard deviations, and ranges for interobserver aggreement scores and kappa means and ranges for three preschools for the OSRAC-P

	Preschool R				Preschool L				Preschool B				Grand *M*
	M	*SD*	Min	Max	*M*	*SD*	Min	Max	*M*	*SD*	Min	Max	
Physical activity level													
Kappa	0.70	0.15	0.18	0.92	0.86	0.12	0.54	1.00	0.83	0.11	0.57	0.97	0.80
Interval agreement	0.86	0.06	0.70	0.95	0.91	0.07	0.70	1.00	0.91	0.06	0.77	1.00	0.90
Physical activity type													
Kappa	0.84	0.12	0.50	1.00	0.94	0.05	0.82	1.00	0.94	0.06	0.77	1.00	0.91
Interval agreement	0.93	0.05	0.80	1.00	0.96	0.04	0.87	1.00	0.97	0.03	0.87	1.00	0.95
Location													
Kappa	0.88	0.33	0.00	1.00	0.93	0.24	0.00	1.00	0.88	0.11	0.79	1.00	0.90
Interval agreement	1.00	0.01	0.97	1.00	1.00	0.01	0.95	1.00	1.00	0.01	0.95	1.00	1.00
Indoor activity context													
Kappa	0.89	0.22	0.00	1.00	0.97	0.07	0.75	1.00	0.95	0.14	0.29	1.00	0.93
Interval agreement	0.97	0.03	0.87	1.00	0.99	0.02	0.93	1.00	0.97	0.09	0.53	1.00	0.98
Outdoor activity context													
Kappa	0.94	0.07	0.82	1.00	0.89	0.24	0.00	1.00	NC[a]	0.00	0.00	0.00	0.92
Interval agreement	0.99	0.02	0.90	1.00	0.98	0.03	0.83	1.00	1.00	0.00	1.00	1.00	0.99
Activity initiator													
Kappa	0.66	0.41	0.00	1.00	0.84	0.28	0.00	1.00	0.94	0.11	0.67	1.00	0.81
Interval agreement	0.94	0.10	0.57	1.00	0.98	0.06	0.68	1.00	0.99	0.02	0.88	1.00	0.97
Group composition													
Kappa	0.71	0.23	0.15	1.00	0.77	0.22	-0.08	1.00	0.89	0.11	0.65	1.00	0.79
Interval agreement	0.85	0.14	0.43	1.00	0.89	0.08	0.72	1.00	0.95	0.05	0.78	1.00	0.89
Prompts													
Kappa	NC[a]	0.00	0.00	0.00	NC[a]	0.00	0.00	0.00	NC[a]	0.00	0.00	0.00	NC[a]
Interval agreement	1.00	0.00	0.98	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00

Note. OSRAC-P = Observational System for Recording Physical Activity in Children-Preschool Version; *M* = mean; *SD* = standard deviation; Min = minimum; Max = maximum.
[a]NC denotes kappa not calculated due to nonoccurrences of the event or behavior of interest.

agreed on the eight observational categories and accompanying codes. Relatively lower IOA scores occurred occasionally for the physical activity level, initiator of activity, and the group composition categories. Most of the observer disagreements for physical activity level occurred when one observer coded Level 1–stationary or motionless and the other observer recorded Level 2–stationary with limb or trunk movements. Given the relative subtlety of the two codes and our plan to combine the two into a composite "sedentary measure" for future data analyses, we have not viewed these coder disagreements as a significant difficulty when trying to determine meaningful differences in preschool children's physical activity levels. With respect to observer differences for the activity initiator codes, those disagreements sometimes occurred and continued across multiple adjacent observational intervals. Nevertheless, only one mean kappa score for activity initiator for Preschool R was lower than .80 (i.e., mean kappa = .66), and the category-by-category information for the activity initiator category indicated that observers agreed on the vast majority of coding intervals for this category. Finally, prompts for physical activity codes were extremely rare behavioral events during observations, and, at times, the frequent nonoccurrence of prompts prevented calculation of a kappa statistic.

OSRAC-P Data From Three Illustrative Preschools

To describe the nature and potential uses of OSRAC-P information for preschool children's physical activity we have developed three figures. It should be noted that the data presented are for illustrative purposes only and we are not making any inferences about the information or its subsequent analyses.

Preschool Children's Physical Activity Levels in Three Preschools

The children in spent the overwhelming majority of observational intervals in the combined Level 1–stationary or motionless and Level 2–stationary with limb or trunk movements (i.e., Preschool R = 80.6%, *SD* = 5.4; Preschool L = 84.9%, *SD* = 4.6; and Preschool B = 87.5%, *SD* = 3.8, respectively). With respect to Level 3–slow-easy movements, they spent many fewer intervals than in the two stationary levels (i.e., Preschool R = 13.0%, *SD* = 3.2; Preschool L = 9.6%, *SD* = 3.0; and Preschool B = 8.6%, *SD* 2.4, respectively). Finally, the preschoolers spent a limited number of observational intervals in the combined Level 4–moderate and Level 5–fast movements (i.e., Preschool R = 5.0%, *SD* = 2.9; Preschool L = 4.1%, *SD* = 1.8; and Preschool B = 1.8%, *SD* = 1.3, respectively).

Preschool Children's Indoor Activity Contexts in Three Preschools

The percentages of total intervals for the 15 indoor activity contexts for children's physical activity are graphed in Figure 1. As shown in the figure, variability across both the indoor activity contexts and the three preschools was evident. Nonetheless, three classroom contexts—transition, snacks, and naptime—accounted for the most frequently coded activity contexts for the children. Another frequently coded classroom activity was group time, but it varied greatly across the three preschools. Finally, several classroom contexts—time out, teacher-arranged physical activity, music, and gross motor—were rarely observed activities for the children.

Preschool Children's Outdoor Activity Contexts in Three Preschools

The percentages of total intervals for the 12 outdoor activity contexts for children's physical activity in the three preschools are graphed in Figure 2. As revealed in the figure, again, variability across both outdoor activity contexts and the three preschools was apparent. In general, three playground or gym contexts, open space, fixed equipment, and ball and object play, accounted for numerous outdoor activity contexts during observations. Several contexts—time out, teacher-arranged physical activity, sand box, pool activities, and games—were rarely recorded activity contexts for children during play.

Preschool Children's Physical Activity Types in Three Preschools

The percentages of total intervals in which children exhibited 17 physical activity types in the three preschools are graphed in Figure 3. As shown in the figure, similar to indoor and outdoor activity contexts, variability across both children's physical activity behaviors and the three preschools was evident. Four behavioral topographies—sit and squat, lie down, stand, and walk—accounted for much of children's physical activity behavior. In comparison to these four behaviors, many other physical activity forms—throw, swing, swim, roll, rock, ride, rough and tumble play, pull and push, jump and skip, dance, crawl—and climb were rarely exhibited by children throughout their preschool days.

Discussion

During development of the OSRAC-P we either refined observational codes from existing direct observational systems or developed new codes for a direct

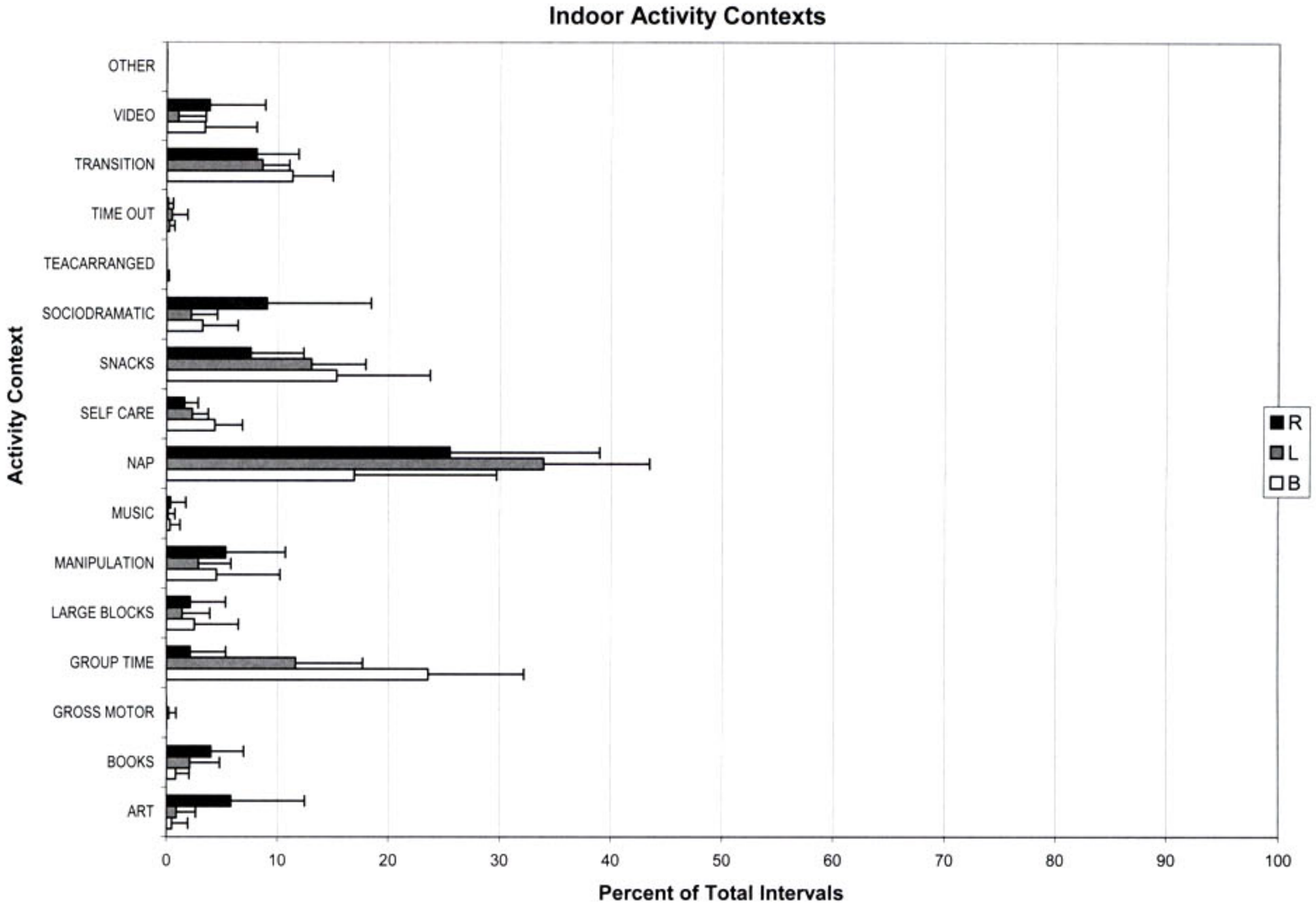

Figure 1. Total number of intervals with marked standard deviations for indoor activity contexts by preschool.

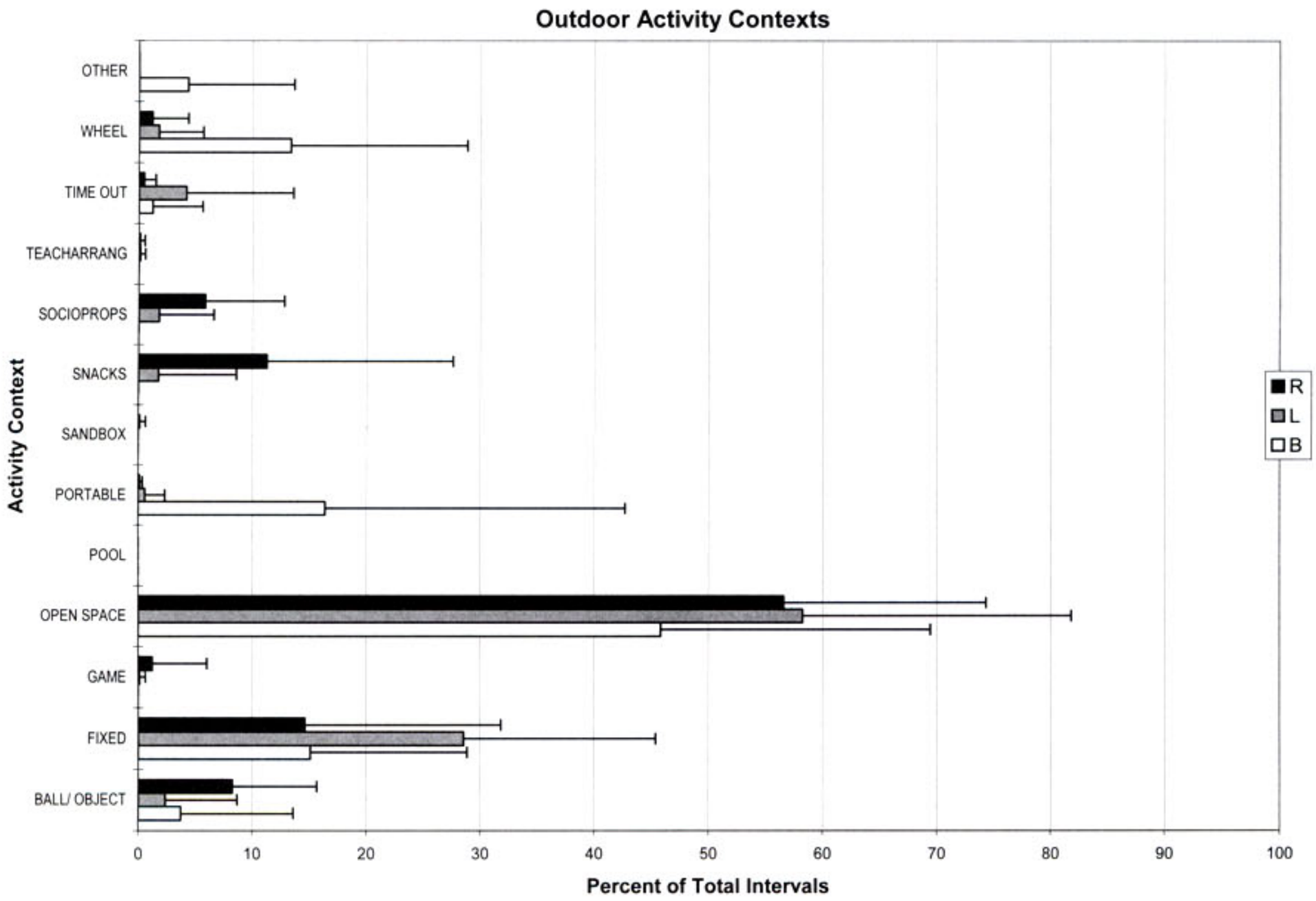

Figure 2. Total number of intervals with marked standard deviations for outdoor activity contexts by preschool.

observational system that allows well trained observers to systematically record children's physical activity and its immediate social and nonsocial contexts. We developed the OSRAC-P and used it in preschools, with at least 5 hr per child of direct observation data.

Our purpose in presenting OSRAC-P information for the three preschools was to illustrate the relative comprehensiveness of the observational system compared to other existing systems as well as some of its potential descriptive uses. Clearly, once data collection is completed, more sophisticated statistical analyses of the information will be warranted. One area of particular interest to us will be linking moment-to-moment contextual and behavioral circumstances to preschool children's physical activity levels. For example, regression (e.g., Darlington, 1990) and conditional probability (e.g., Bakeman & Gottman, 1997) analyses may be particularly helpful in determining which indoor and outdoor activity contexts predict preschoolers' moderate to vigorous physical activity (MVPA) and sedentary behaviors. In addition, similar analyses might allow us to better determine the behavioral factors associated with physical activity that are likely to promote increased MVPA (e.g., running, tricycle riding, climbing). Careful descriptive analyses of the moment-to-moment contextual and behavioral factors associated robustly with children's enhanced physical activity might allow us to better plan and evaluate effective and practical interventions to promote children's physical activity within preschools.

Limitations of the OSRAC-P

Although the current OSRAC-P has advantages in collecting contextual (e.g., activity contexts) and behavioral (e.g., physical activity type) information over other direct observation systems, at present several limitations should be noted. First, similar to many other direct observation systems, validity information is not currently available (cf. Hartmann & Wood, 1990). Nevertheless, we are collecting accelerometer data, which has been a valid assessment of preschool children's physical activity (e.g., Finn & Specker, 2000; Reilly et al., 2003; Sirard, Trost, Dowda, & Pate, in press). Future correlational analyses may allow us to link the OSRAC-P information with more objective accelrometer data to evaluate its concurrent validity.

Second, given that the OSRAC-P was initially developed for descriptive purposes, we do not presently have information about its sensitivity to changes in children's behavior during interventions to promote their physical activity. In the future, however, we will be assessing the

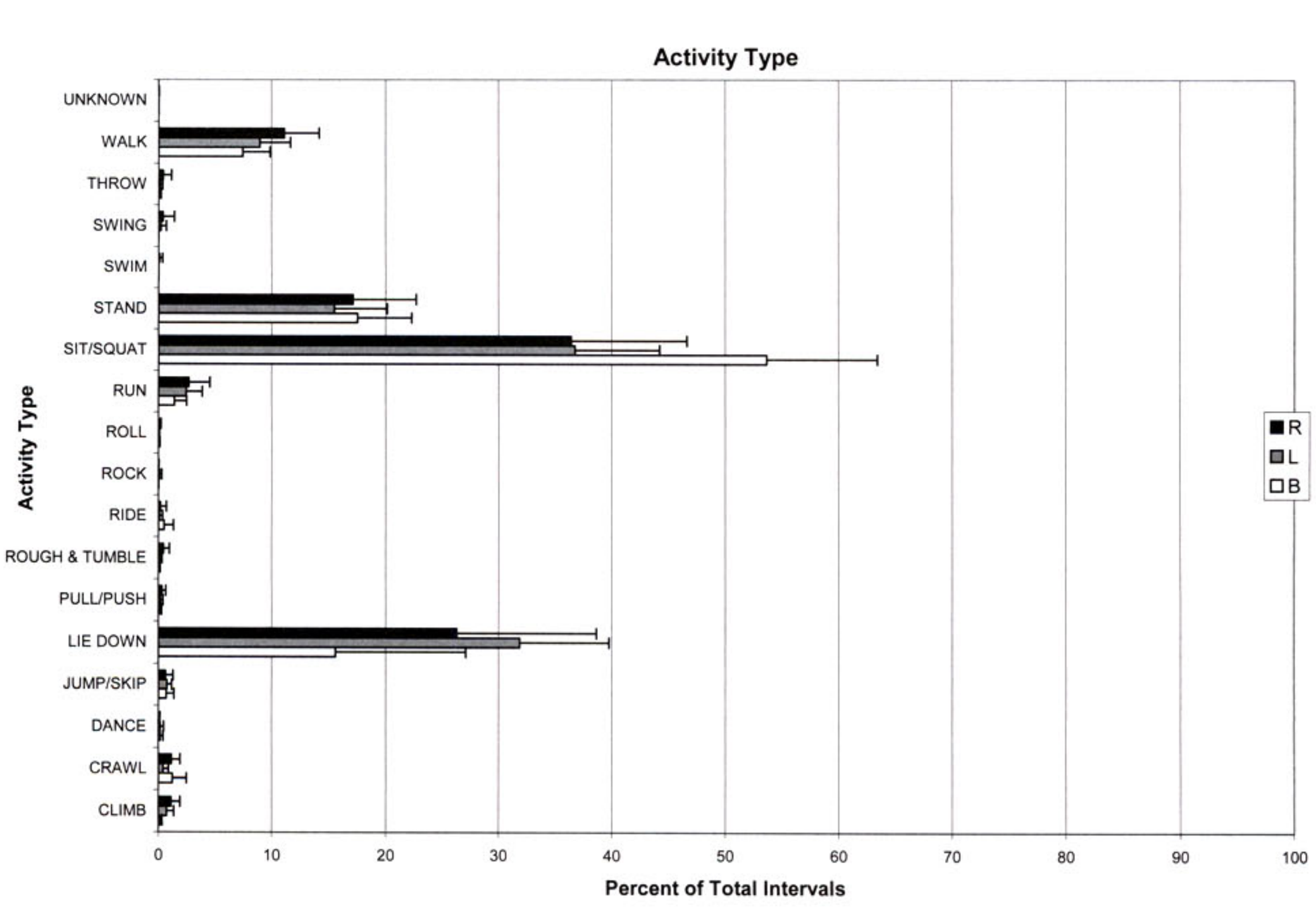

Figure 3. Total number of intervals with marked standard deviations of physical activity types by preschool.

potential of the OSRAC-P to accurately record physical activity in nonintervention and intervention circumstances in which teachers plan and actively encourage preschool children's increased MVPA. The use of a single-case research design with rapidly alternating treatments across several children will allow us to determine whether the OSRAC-P is useful for evaluating physical activity changes following teacher-implemented MVPA interventions (Kratochwill & Levin,1992).

Third, the OSRAC-P uses a 5-s observe and 25-s record momentary time-sampling procedure. Although the INTMAN software system allows for longer observational intervals with shorter recording phases per observation, in our experience it is unlikely observers can code eight observational categories with multiple accompanying codes and maintain high levels of inter-observer agreement with longer observational intervals (Brown et al., 1999). Indeed, additional observational error might negatively influence our ability to continue to capture contextually and behaviorally rich information. Hence, we do not have "real time" behavioral and contextual data for preschool children's physical activity. Nevertheless, to our knowledge, other existing high-quality direct observation systems including the CARS, BEACHES, and SOPLAY do not yield "real time" information either.

Finally, the OSRAC-P was developed with young children (i.e., 3-, 4-, and 5-year-olds) in preschool settings. Given the facts that contextual circumstances change radically for both younger toddlers and older kindergarten and elementary school-age children and that other behavioral settings may be important for young children's physical activity, some of the OSRAC-P categories and accompanying codes may not be as relevant for other age groups and other settings. We have recently begun to modify the OSRAC-P system for older children and children's homes and other community settings.

Conclusions

We believe that a significant and continuing need to become better informed about preschool children's physical activity is apparent. Obviously, the limited observational data we reported in this paper only illustrate how we may use the OSRAC-P information in future analyses of preschoolers' physical activity. Despite the several limitations discussed, we believe the OSRAC-P may allow reseachers to better investigate, both descriptively and experimentally, young children's physical activity in the future. Moreover, the data generated with the observational system will provide contextually and behaviorally rich information about the social and nonsocial factors related to preschool children's physical activity. Once researchers have accurate descriptive information about children's physical activity and related social and nonsocial factors in preschool, home, and community environments, additional policy and practice intervention research is sorely needed (cf. Pate, 2001; Pate et al., 2004). Given the significant number of children participating in preschools in the U.S., until acceptable, feasible, and useful preschool assessments and interventions are developed and widely used by early childhood professionals, our early intervention and prevention efforts related to children's physical activity may simply be inadequate for promoting their healthy lifestyles and better long-term health outcomes.

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