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RESEARCH

Indoor Waterpark: An Examination of Physical Activity Levels and Use Patterns of Youth Participants

William D. Ramos and Craig M. Ross

This study examined patterns and levels of physical activity of youth participants at an indoor waterpark in rural southern Indiana. The System for Observing Play and Recreation in Communities (SOPARC) was the instrument used to guide data collection for the study to determine youth physical activity postures coded as sedentary, walking, or vigorous. Participants consisted of youths, ages 4 to18, who attended the park during the data collection. Results converged into seven main target areas representing data for age groupings, gender, and physical activity postures. Frequencies were calculated for variables involving counts and moderate-vigorous physical activity (MVPA). A series of one-way analysis of variance (ANOVA) were performed using total metabolic equivalents (METs). Physical activity in the waterpark was shown to have the capability to produce moderate and vigorous levels of physical activity overall and to also generate a variety of differences among individuals and activity areas at the facility.

Keywords: indoor waterpark, SOPARC, physical activity, obesity, overweight

Throughout the United States an issue of epidemic proportion has taken hold of today's youth. The epidemic has been identified as a lack of physical activity (sometimes examined through the lens of inactivity) and has resulted in a significant increase in the number of Americans categorized as overweight or obese at associated levels of severity (Biro & Wien, 2010). For youths, the problem becomes particularly troubling because longitudinal research shows that about one third of preschool children and one half of school-age children with weight issues continue on to become adults suffering from the same or worse levels of obesity (Serdula et al., 1993). Physical health consequences have been documented ranging from dramatic increases in type II diabetes (Mokdad et al., 2003) to major orthopedic issues including a prevalence of osteoporosis (Tukker, Visscher, & Picavet, 2009). Within the area of mental health, Wang, Ianotti, and Luk (2010) identified increased victimization and bullying of overweight youth that can begin in early childhood development and continue throughout the lifespan. It also has been found that low

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self-esteem is more prevalent among overweight and obese youth when compared with their normal weight peers (Wang, Wild, Kipp, Kuhle, & Veugelers, 2009).

It has become apparent within the context of physical activity that disparities exist across population segments, including those stemming from geographic location of residence and population density (e.g., urban versus rural). Research on population density and physical activity has revealed that youths living in areas designated as rural face significant challenges when compared with their urban counterparts (Liu, Bennett, Harun, & Probst, 2008). This same information revealed that the majority of overweight youths come from states within the Midwest and Southern regions of the U.S., which are regions containing high numbers of people who live in rural settings.

From the lens of leisure behavior, a movement is taking place to acknowledge the influence that parks can have as a force for intervention with regards to health issues as well as the development of appropriate tools to measure the effect that parks have on physical activity (Godbey, Caldwell, Floyd, & Payne, 2005). As this movement to explore the ability of leisure service providers to enhance health progresses, most if not all of the research has focused on how public parks and community spaces can contribute to this cause.

As the United States puts forth efforts to find the means to increase options for people to engage in a more active lifestyle, it appears an avenue involving not only public but private park settings has been overlooked. Although a growing number of studies, such as the one conducted by Corder, Ekelund, Steele, Wareham, and Brage (2008), investigate appropriate subjective and objective methods to assess physical activity in a variety of settings, little research has focused on the effectiveness of privately owned waterpark facilities as viable resources to enhance health through physical activity.

There are currently more than 1,000 indoor and outdoor waterparks operating in North America with the majority being privately owned (60%) and the remaining operated in the public sector (Martin & Kozen, 2009); these waterparks are contributing to the options people have to engage in appropriate healthy active lifestyles. Over the last decade, the United States has seen almost a 60% increase in waterpark development, especially with indoor waterparks in the Midwest region (Sangree, 2008). Considering the scope of the identified need to promote physical activity among youth populations and to understand better how parks can contribute within the scope of public health, waterparks should not be left out of the equation. By examining existing waterpark facilities, we may more accurately determine if incidental wellness is already occurring at these sites and identify a plausible phenomenon that could inspire the industry to recognize a potential to promote increased physical activity. Such outcomes could possibly influence future changes in design and operation of waterparks, both private and public. The purposes of this study, therefore, were to assess participant patterns of use as well as to determine the degree to which an indoor waterpark, located in a rural community, may contribute to physical activity for males and females, ages 4–18 years. Specifically, we asked whether patterns emerged among the percentages of those who engaged in moderate-vigorous physical activity (MVPA) within seven designated main target areas at the indoor waterpark. In addition, we wondered if there were any differences in total metabolic equivalent (MET) levels for youth

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gender and age groupings, as well as differences in total MET levels within the seven target areas.

Background

Youth Physical Activity/Inactivity Issues and Consequences

Both academic and trade publications contain abundant information that leads us to the conclusion that youths in the United States are suffering from serious lack of physical activity and resulting lifestyle illnesses. Physical inactivity generally has been measured in one of two ways: norm- or criterion-referenced tests (Smith & Biddle, 2008). Within norm-referenced testing, individuals are compared with normative standards set by peers within the same demographic group often based upon the normal probability curve. Within criterion-referenced testing, individuals are compared with a set of externally-established standards or thresholds. It is the criterion-referenced method that is used most extensively by epidemiologists because it compares data to an objective baseline which can be linked to minimum levels of physical activity necessary to gain health benefits (Bernstein, Morabia, & Sloutskis, 1999).

From an historical perspective, data reported by the Centers for Disease Control and Prevention (2011) reported that approximately 16% of children ages 6–19 years were overweight or considered to be at risk for becoming overweight, with another 20% falling into the obese category. When current data were compared with data previously collected from the 1960s, they revealed a steady increase in the reported number of children and adolescents who were overweight each year since the study was conducted. Hedley, Ogden, Johnson, Carroll, Curtin, and Flegal (2004) stated that the prevalence of overweight and obesity has increased markedly in the last two decades within the United States. This trend held true for both male and female youths and for various subsets related to race and ethnicity. Furthermore, Healthy People 2010 (2000) reported overweight and obesity as one of the top ten leading health indicators for children and adults.

Issues for Rural Communities

Geographical location is a factor affecting physical activity and weight issues. The prevalence of physical inactivity and obesity for youths is 25% higher for those living in rural areas compared with those living in areas designated as urban (Muskie School of Public Service, 2008). Within this same research, factors related to youths in rural communities identified reasons why they are more likely to become overweight or obese. The factors included (a) living in rural areas created unique barriers to being sufficiently active; (b) parents lacked engagement as role models; (c) insufficient community design and safety; (d) lack of sufficient programming; (e) negative policy implications; and (f) difficulty altering built environments. The research further concluded and reaffirmed that this population should be given top priority in anti-obesity efforts.

In the study by Liu et al. (2008), the variables of overweight and physical activity were compared between subjects who were living in either rural or urban settings. By highlighting the importance of factors related to youths living in rural areas, data from the National Survey of Children's Health (Data Resource Center on Child and Adolescent Health, 2003) revealed disparities generating a call for concern. The data revealed that youths (ages 10–17 years) from rural settings were overall more likely to be overweight (16.5%) than youths from urban areas (14.3%). Other results suggested that rural male youths experienced a higher percentage of overweight than their urban counterparts, while the percentages between female youths were comparable (Liu et al., 2008). The majority of the overweight numbers for youth came from the Midwest and Southern regions of the United States. This information is important to emphasize the need and support for conducting the current study at the selected site in rural southern Indiana.

Ecological Systems Theory

Based on the seminal work of Bronfenbrenner (1979), the Ecological Systems Theory (EST) examined interrelationships of individual organisms with their environment as a means to describe the social and cultural aspects that influence the human experience (Gauvain & Cole, 2004). Bronfenbrenner approached EST from the standpoint that individuals function as the result of influences from multilayered environments that act upon and influence each other. It was Bronfenbrenner's (1979) strong contention that research on the relationships of human development and the environment was stifled by placing subjects in a laboratory for study instead of using methods that allowed data collection of subjects interacting naturally with their environments. Much like the comparable work of Lewin (1935), it is important within EST that interactions with the material world are viewed by how they are *perceived* by the person and not from an objective lens.

An Ecological Model for Active Living and the Role of Leisure and Recreation

Evolving from the Ecological Systems Theory and combined with efforts to combat physical inactivity, Sallis et al. (2006) proposed an ecological model that looks at intervention through an interrelated series of components including social and physical environments as well as the impact of policy to achieve changes within a population. It was proposed that recreation holds a prominent place within four domains comprising an active living lifestyle. These domains included (a) recreation, (b) transport, (c) occupation, and (d) household. Sallis et al. (2006) believed that an ecological model was best suited to influence behavior on a mass scale when compared with theories and models that have been previously used. With an ecological model, a host of factors that influence physical activity come into play synergistically to have an impact on a much broader scale. The impact of recreation and leisure time activity on the ecological model remains of great importance to the overall picture.

Theorists and researchers within the field of leisure behavior advocate that the discipline needs to investigate its role in physical activity and how it can contribute to active living. It has not been until recently that the question has been examined through systematic research efforts (Godbey et al., 2005). Godbey et al. (2005) recognized some efforts, but also believed that there are many opportunities yet to be explored by leisure researchers including (a) studies of environmental, lifespan,

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and motivational influences, (b) forming partnerships, and (c) greater use of objective measures of physical activity. This study was designed to take advantage of one such objective measure known as the System for Observing Play and Recreation in Communities (SOPARC). The results can become part of the multilevel contributions that need to be present for the ecological model to be effective.

System for Observing Play and Recreation in Communities (SOPARC)

SOPARC is a data collection instrument designed to employ observational coding of characteristics for individuals at play within shared recreational settings. According to McKenzie, Cohen, Sehgal, Williamson, and Golinelli (2006), the instrument was created to help assess activity levels of people in more open settings along with other contextual characteristics that come into play with recreational spaces. Although there are other measures available such as accelerometers, heart rate monitors, and doubly labeled water, they are limited in their design by only accounting for the individual and not giving an accurate portrayal of the space itself in relation to its ability to provide avenues for physical activity. McKenzie et al. (2006) noted that because of a lack of objective measures to assess group physical activity in open environments, there has been a lack of data on their impact as possible contributors to public health.

The SOPARC instrument is grounded in the concept of Momentary Time Sampling (MTS). Time sampling is a technique where time is divided into distinct units, and then behaviors are coded as either occurring or not occurring within the identified timeframes. There are two types of time sampling techniques (i.e., partial interval and momentary time sampling). The study by Saudargas and Zanolli (1990) suggested that MTS is the preferred method because it has proven effective in assessing naturally occurring behaviors in the field. The ability for MTS to capture information in naturally occurring places lends itself to be a preferred objective measure in parks and other open spaces in which people come and go freely.

MTS is used within SOPARC to make systematic scans of predetermined target areas. A scan consists of a visual sweep of the target area from left to right. During each scan, the researcher has a specific task to code while the sweep is taking place. Scans can be made to code gender, ethnicity, accessibility, equipment, and physical activity postures. Before observations are made, the site must be mapped out for target areas by drawing boundaries. The map is constructed using input from all those involved to make sure the target areas are understood and agreed upon before beginning actual data collection. Factors affecting the designation of target areas may include items such as (a) overall size of the space, (b) natural or built boundaries, (c) number of users, (d) activity levels of those using the space, and (e) the number of characteristics to be coded (McKenzie, 2005). Sometimes a target area may have logical boundaries but be too large to be scanned effectively all at once. In this case, target areas may be further subdivided in smaller target areas. When subtarget areas are used, the information can later be aggregated to give an assessment on the larger target area. For this study, the seven target areas identified were plunge pool, lazy river, multiuse pool, waterslide stairs, infant/child play pool, water playground, and the deck area.

Reliability originally was established for SOPARC through a study conducted using 16,244 subjects in 165 park areas within the city of Los Angeles. Results concluded that reliabilities for collecting data on age group, gender, area contexts, and activity level groupings were within acceptable ranges from 80% to 94% for percent agreements. The overall conclusion stated that, "SOPARC is a reliable and feasible instrument for assessing physical activity and associated contextual data in a community setting" (McKenzie et al., 2006, p. S208).

Method

Study Design and Sample

Study site. The site selected for this study opened for business in 2009 and is a 40,000 square feet waterpark and hotel resort. It was selected for the following reasons: (a) its location in southern Indiana classified it as a rural area; (b) area residents were able to gain access through daily or season passes even if they were not staying at the resort; (c) the park had the distinction of being the largest indoor retractable domed waterpark in the United States; (d) the park provided a diverse clientele that included local residents and tourists; (e) it was an indoor/outdoor park which allowed for collection of data during the winter months or inclement weather situations; and (f) the park contained attractions that were representative of typical waterparks (e.g., slides, lazy river, play gym).

Participants. Subjects of this study were those youths attending the waterpark on the days and times data collection occurred. The premise within SOPARC is that all youths in the park at the time of a data collection scan were considered a study subject. The primary researcher and a reliability observer coded only youths determined to be between 4–18 years of age.

Instrument

SOPARC was chosen as the data collection instrument, because (a) it involved noninvasive observation; (b) had existing reliability allowing collection of valid data (McKenzie et al., 2006); (c) had the ability to derive MVPA and MET measures; (d) had the ability to provide data segmented by gender and age group; and (e) required a relatively low cost when compared with other measures.

To achieve the highest reliability measures for data collection, two observers were present at all times to code characteristics (i.e., age, gender, activity coding). Both the primary researcher and reliability observer attended two training sessions (16 hr total) to become proficient in the use of the collection instrument. Training consisted of in-laboratory orientation and practice as well as on-site practice sessions. Coding repetition occurred until both the primary researcher and reliability observer were familiar with the target area, boundaries, participants, and physical activity postures. In addition to identifying and mapping target and subtarget areas, it was determined that there were 12 postures that were unique to the waterpark setting and required clarification for use in SOPARC. To make a decision on how the identified postures should be coded, a jury of experts was assembled and requested to view the SOPARC training video segment that explained and demonstrated

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coding for typical activity postures. The panel was then asked to reflect on the list of 12 postures in question, along with the information acquired from SOPARC, and make a final recommendation for each.

Data Collection

Approval for the study and data collection was acquired through the Indiana University-Bloomington Human Subjects Office. Data collection occurred during March–May 2012 on four nonconsecutive days consisting of four observation rounds of the waterpark within each day. Dual scans obtained from the primary researcher and reliability observer were analyzed for interobserver reliability by using a Pearson product-moment correlation coefficient. Results showed that the two variables were strongly correlated, $r\,(5564) = .948$, $p < .001$. Correlation results confirmed use of the averaged data counts in the remaining analyses.

Frequencies for observed counts. The study consisted of 11,136 individual scans completed between the primary researcher and reliability observer during data collection. After data were reduced by calculating the mean for each of the scans between observers, averages were determined resulting in 5,568 counts of useable data. Total aggregated counts for the waterpark equaled 2,000. The sample comprised 1,039 females and 961 males observed. Separated by age, there were 1,483 youths between the ages of 4–12 years and 517 youths observed who were between 13–18 years of age.

Analyses. The data were reduced by calculating mean activity counts from the double-scan data to achieve a single count between the primary and reliability observers. The resulting numerical data became the primary set of counts used to represent the number of people observed and their coded activity levels. Training observers and precise mapping of target areas/scan spaces were crucial to obtaining the needed reliability measures for data analysis.

Once this was completed, data were aggregated from the 29 subtarget areas to create the seven main target areas of interest. Analyses for frequencies were conducted using this information to determine answers to the research questions regarding use characteristics for gender, age groups, and target areas.

Results from this process then were used to examine frequencies and test for any significant differences between variables by performing a one-way analysis of variance (ANOVA). In addition, total metabolic equivalent (MET) scores from the categories coded as walking and vigorous activity were aggregated to form moderate-vigorous physical activity (MVPA) totals and their resulting percentages. This information was used to answer the research questions regarding the waterparks characteristics and ability to generate levels of physical activity.

Results

Total METs by Combined Gender and Age Groups

One-way analyses of variance (ANOVAs) were calculated to assess differences in total METs generated by combined gender and age groups. As part of performing the ANOVAs, Levene's Test for Homogeneity of Variance resulted in a level of significance of $p < .001$ that indicated the assumptions of homogeneity had been violated. This was assumed to be due to a large number of coded observations that yielded zero participants during scans causing there to appear to be a kurtosis issue in the distribution of data. Since the scores of zero ultimately had no effect on the calculation of METs, we do not believe the lack of homogeneity to have impacted the findings. As a secondary check, a Welch's Robust Tests of Equality of Means was performed and confirmed a similar result as the ANOVA that the equality of means was significantly violated at $p < .001$.

The ANOVA results indicated that across gender and age groups, a significant difference in total METs was indicated (F (3, 1211) = 7.564, $p < .05$). Table 1 presents the results of the ANOVA test. Tukey's post hoc comparisons for the four groups indicated that male youths ages 4–12 years (m = 6.31, sd = 5.39) produced more METs while using the waterpark than did male youths ages 13–18 (m = 4.62, sd = 3.66). In addition, male youths ages 4–12 years also produced significantly more METs than female youths ages 13–18 (m = 4.85, sd = 3.78). Comparisons between female youths ages 4–12 years (m = 5.59, sd = 4.22) and the other three groups were not significantly different at $p < .05$.

Total METs and Target Areas

A second one-way ANOVA was calculated to examine the data for any significant differences between the dependent variable of total METs and the independent variable of target area. As with the previous ANOVA, Levene's Test for Homogeneity of Variance resulted in a level of significance of $p < .001$ that indicated the assumption again had been violated. A Welch's robust test of equality of means confirmed the same result as the ANOVA indicating the equality of means significantly violated the assumptions at $p < .001$. From the ANOVA results total METs significantly differed among the seven target areas as indicated (F (6, 5567) = 39.457, $p < .05$). Table 2 presents the results of the ANOVA test. Further testing using a Tukey's post hoc comparisons for the target areas indicated that 13 comparisons achieved significant differences in total METs at the level of $p < .05$.

Target area one (plunge pool), target area five (infant/child play pool), and target area seven (deck area) reported no significant results indicating that persons in those areas failed to generate significantly greater total METs than any other target areas at the waterpark. Findings involving the target area three (multiuse pool) and target area four (waterslide stairs) resulted in five comparisons that revealed significant differences five other target areas. The multiuse pool had the greatest

Table 1 ANOVA: Total METs and Combined Gender and Age Groupings

Source	SS	*df*	MS	F
Between groups	475.59	3	158.53	7.56*
Within groups	25382.34	1211		
Total	25857.94	1214		

* $p < .001$

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impact on METs when compared with other areas in the park which we expect to have resulted from the design of that attraction because it promoted guided game play such as water basketball, tornado/vortex pool, and an agility ropes course. Means and standard deviations for total METs generated within each of the seven target areas are presented in Table 3.

Moderate-Vigorous Physical Activity (MVPA)

MVPA was calculated by first assigning MET values (1.5 = sedentary, 3 = walking, and 6 = vigorous) to the aggregated observation counts within target and subtarget areas. Overall contributions to the total from assigned METs included (a) sedentary behavior for 27% of the time, (b) walking for 44% of the time, and (c) vigorous behaviors for 29% of the time. Combined walking and vigorous outcomes produced MVPA percentages. To exclude the sedentary value in the calculation of MVPA, only cases where METs > 1.5 were selected when performing the analyses.

MVPA for gender and age groupings. When examining percentages of MVPA for gender and age groups, Table 4 shows that all variables were close in their overall contributions to the total. Male youths ages 4–12 contributed 10% more to the total for all youths ages 4–12. For all youths ages 13–18, females contributed 14% more to that grouping's total percentage of MVPA. As with counts, the trend continued with male youths ages 13–18 contributing the lowest percentages.

Table 2 ANOVA: Total METs and Target Areas

Source	SS	*df*	MS	F
Between groups	2311.62	6	385.27	39.45*
Within groups	54299.31	5561	9.76	
Total	56610.92	5567		

* $p < .001$

Table 3 Means and Standard Deviations for Total METs and Target Areas

Target Area	Mean	Standard Deviation
1—Plunge pool	.75	2.53
2—Lazy river	1.41	3.35
3—Multiuse pool	2.20	4.93
4—Waterslide stairs	4.69	.33
5—Infant/child play pool	1.17	.21
6—Water playground	1.55	3.35
7—Deck area	.59	1.72

Table 4 MPVA for Gender and Age Groupings

	Youths 4–12 Years of Age		Youths 13–18 Years of Age	
Gender	***n***	**%**	***n***	**%**
Female	2,073	45	786	57
Male	2,532	55	594	43

Note. Percentages for females and males may not total to 100% due to rounding during calculations.

MVPA by target area. Results revealed that the target area one (plunge pool) yielded the lowest MVPA percentages contributing only 2% of the total while the target area three (multiuse pool) generated the largest percentage at 27% (see Table 5). Target area two (lazy river) had the second largest percentage of the total MVPA at 25%. Although the name of this attraction may lead one to believe that it would not contribute to physical activity, it was discovered that most youths using this area were observed frequently engaging in arm and leg actions for propulsion purposes. The area also seemed to promote competition between youths for things such as inner tube races that added to the number engaging in MVPA.

It should be noted that target area seven (deck area) produced a higher percentage of MVPA than three of the other target areas with 17% of the total (plunge pool, infant/child play pool, and waterslide stairs). Although it may seem counterintuitive that the deck area would produce a greater percentage of MVPA than other areas, it may in part be explained from the fact that the deck area is the means by which people get from one place to another in the waterpark mostly by walking and sometimes vigorous (running) postures. In addition, the plunge pool did not allow for much activity due to its purpose and waterpark policy. Participants are not allowed to be in the plunge pool for long periods of time and the number allowed in the area is small. The infant/child play pool simply does not generate much activity by the youths studied since that target area seemed to attract mostly participants under the age of 4. Those who were using the area many times were engaged in guided activity with parents holding them or more passive activity on the swings. When observing the waterslide stairs, it appeared to be a less active place than expected overall, especially for youths ages 4–12, due to the amount of standing in line that was necessary to wait for access to the waterslides.

MVPA for combined gender and age groups. Analysis of the MVPA for combined gender and age groupings by target area concluded that male youths ages 4–12 contributed the largest percentage of MVPA regardless of target area as illustrated in Table 6. This age group was followed by female youths ages 4–12, with male and female youths ages 13–18 sharing the lower one third of the total (1%–16%). Examining ranges within the spread of percentages for combined gender and age groups by target areas, youths ages 4–12 had a smaller spread in scores (5% and 8%, respectively) than those of youths ages 13–18 (10% and 14%, respectively). This indicated that youths ages 4–12 tend to use the park in a more equally distributed manner than those youths ages 13–18. In addition, youths ages 4–12 shared the infant/child play pool when reporting high-end percentages, and youths ages 13–18 also reported this same area but as their lowest percentages.

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Table 5 MVPA by Target Area

	Target Area													
	1		2		3		4		5		6		7	
Gender/Age	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
MVPA	135	2	1506	25	1632	27	360	6	213	4	1110	19	1029	17

Note. Target Areas: Target area 1 = plunge pool, target area 2 = lazy river, target area 3 = multiuse pool, target area 4 = waterslide stairs, target area 5 = infant/child play pool, target area 6 = water playground, and target area 7 = deck area.

Table 6 MVPA for Gender and Age Grouping by Target Area

	Target Area													
	1		2		3		4		5		6		7	
Gender/Age	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
FY1	45	33	465	31	555	34	114	32	93	44	423	38	378	37
MY1	63	47	645	43	669	41	135	38	105	49	525	47	390	38
FY2	18	13	246	16	213	13	54	15	126	6	75	7	168	16
MY2	9	7	150	10	195	12	57	15	31	1	87	8	93	9

Note. Target Areas: Target area 1 = plunge pool, target area 2 = lazy river, target area 3 = multiuse pool, target area 4 = waterslide stairs, target area 5 = infant/child play pool, target area 6 = water playground, and target area 7 = deck area. Combined gender and age groupings: FY1 = Female youths ages 4–12; MY1 = male youths ages 4–12; FY2 = female youths ages 13–18; and MY2 = male youths ages 13–18.

Although the high-end percentages for youths ages 4–12 years were unexpected, it was intuitive that youths ages 13–18 years would generate lower MVPA in an area of the waterpark that was not designed to appeal to their age group. The MVPA generated in this area by youths ages 13–18 could be attributed to those using the pool with younger siblings.

Discussion

Based on the data analyses, male youths ages 4–12 were more physically active than all other gender and age groups with significant differences appearing when compared with youths ages 13–18. Youths ages 4–12 years showed patterns of use indicating that they use areas of the park in a more equally distributed manner than did youths ages 13–18. Youths ages 13–18 were found to spend the majority of their time standing on the waterslide stairs which was determined to be a mainly sedentary activity as a result of waiting in line for that attraction. There were areas of the park that contributed significantly greater MVPA values than others. The plunge pool, infant/child play pool, and the deck area did not produce significantly greater physical activity, either as total METs or MVPA compared with other areas; in contrast, the multiuse pool (5 pairings), waterslide stairs (5 pairings), water playground (2 pairings), and lazy river (1 pairing) all generated MVPA values that were significantly different from other areas.

Looking further at target areas within the park, the multiuse pool produced the greatest number of counts while also producing the greatest MVPA values. Contrary to its industry name, the lazy river produced the highest user counts of any attraction, and was second overall in generating MVPA. The deck area produced the greatest number of user counts because it served as a main thoroughfare between attractions and was fourth overall in producing MVPA. This result indicated that the contributions the deck area has for opportunities for physical activity should not be overlooked even though it is not specifically designed or programmed. In fact, rules normally discourage vigorous activity such as running and faster movement on the pool deck due to safety concerns over slips and falls. Not surprisingly, the plunge pool produced the lowest counts and also the lowest MVPA score. This is most likely due to the fact that the designated purpose of the plunge pool does not allow for much activity nor large numbers of simultaneous users.

Both the Ecological Systems Theory (EST) and the Ecological Model for Active Living revolve around the concept that individual actions are the result of a multifaceted interaction among layered structures that shape who we are and give direction to our behaviors. The individual is addressed as being influenced by the social, cultural, and material constructs they encounter during immediate and longer term experiences. Results from this study supported both an Ecological Model of Active Living (Sallis et al., 2006) and Ecological Systems Theory (Bronfenbrenner, 1979) by providing some specific examples of how the built environment worked to impact behaviors related to physical activity. Findings from the study provided implications on how youths are impacted by the design and nature of the attractions within the facility. Maximum physical activity seems to result from those water park activities that engender the greatest number of different action options as well as active interactions with other individuals. It should not be surprising that the

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multiuse pool, the lazy river, and even the pool deck produced the greater number of METs and MVPA than the small, single purpose plunge pool or the popular waterslides in which the predominant activity was standing and waiting for access. Interestingly, the EST would support the fact that by increasing the number of waterslides to reduce waiting lines would increase the MVPA from mostly sedentary to relatively vigorous if continually climbing up stairs to the slides.

Within EST, the waterpark gives an example of how material assets can play a role in connecting the individual to available resources that may impact healthy behaviors. As a major recreation facility for the residents of rural southern Indiana, the waterpark can be seen as part of the individual's mesosystem by providing a setting that linked existing microsystems through social interaction. It also enhanced goals for physical activity that were set within other microsystems including public school physical education and health programs. The impact of microsystems on participant behavior and decision making was evident when examining the role of family and peer groups. Influence was exhibited in regard to the waterpark through several avenues including decision making by parents, siblings, or peer groups centered on choosing the waterpark as their destination. An individual's actions at the waterpark were also influenced by these same peer groups. From the standpoint of physical activity, influences imposed by those in the microsystem provided modeling for active behaviors. When parents were excited and engaged, then children were more active. When youths attended the park with peers they had a support group with whom to interact and who challenged them to engage in physical activity. The multiuse pool presented an example where the highest MVPA levels were recorded. At the same time, it included the most diverse use by both gender and age groups. Observations concluded that there was a greater presence of youths interacting in small groups with other children and adults in this setting than in any other attraction.

Using the Ecological Model of Active Living, the waterpark afforded a variety of active behaviors from sedentary to vigorous by providing the space for diverse kinds of active recreation to occur. The waterpark afforded more general attendance through its policy to allow access by nonguest residents, as well as affording positive connections to perceived environments which included (a) attractiveness, (b) comfort, (c) safety, (d) accessibility, and (e) convenience.

Results from this study should stimulate conversations on how to construct and manage the environments of waterparks more purposefully to contribute to the physical activity levels of their users. From the perspective of public and private facility builders and owner/operators, information from the study can support other proposals to build waterparks as part of a community's recreational assets by giving credence to marketing and promotional efforts. Data showing use patterns and the waterparks ability to generate physical activity can be used as selling points to city government planning councils and financial supporters of such projects. Knowing that youths tend to engage differently in physical activity within waterparks could also help drive the decisions on what features should be part of a facility and what capacity would be needed to fulfill an organization's goals.

Data showing that the majority of energy expenditure was expended through moderate to vigorous physical activity can demonstrate to prospective constituents that a waterpark is not only innately fun, but can provide opportunities for youths to be physically active at moderate, yet healthy levels. For parents, knowing the capacity of a waterpark to encourage physical activity for certain age groups can be valuable information when making destination choices. For example, a parent with older children between the ages of 13–18 years might choose to attend another venue rather than a waterpark because the information gleaned from the study revealed that the park was more suited for promoting physical activity among youths who were ages 4–12. The results of using SOPARC to evaluate physical activity patterns at a waterpark could result in the development of a rating scale that would provide potential participants a general idea of whether a specific waterpark suits their needs in relation to physical activity outcomes.

For waterpark designers and builders, the results from our study ought to draw attention to the fact that the waterparks they create can have a positive impact on youth physical activity and that attractions promoting greater physical activity should be given more consideration. Knowing that different types of attractions have the capability to draw youths of certain age groups can help in determining waterpark layouts that are better designed to enhance opportunities for maximizing physical activity. Attractions such as the lazy river, multiuse pool, and water playground were shown to promote both the number of users as well as their physical activity levels. The impressive physical activity impact found regarding the lazy river might suggest renaming it to be called the "busy river" instead.

Limitations

Due to the nature of our data collection, it is remotely possible that subjects may have changed their behavior if they recognized they were being observed. Unless participants actually knew the purpose of the study, however, the nature of any changes in behavior would be hard to surmise. The results may not be directly generalizable to other waterparks, especially in outdoor venues, due to the individual physical and contextual characteristics of these leisure environments. Although many individual characteristics of the waterpark studied are similar to other water parks as a whole, the cumulative nature of the results are specific to how the individual built environment is designed. Subsequent studies at other water parks using observational instruments such as the SOPARC will determine the degree to which our findings are generalizable. Finally, weather conditions at the time of data collection required that our study use only the indoor area of the waterpark, which constitutes the majority of the facility. The water park did include an outdoor section but it was not available during data collection.

Conclusion

The primary research question, which was to assess overall patterns of use of an indoor waterpark as well as the degree to which selected water park attractions may contribute to physical activity for male and female youth participants, 4–18 years of age, was answered by findings that indicated unique differences in patterns of usage for gender, age groups, and individual target areas. Results provided insight into how and where youth participants at the park generated levels of METs and MVPA. It is important to note that 75% of all physical activity categorized fell within the desired moderate to vigorous categories. Other major findings revealed that youths 4–12 years of age were generally more physically active than youths

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13–18 years of age, and overall, male youths ages 4–12 were more physically active than all other groups studied. We also observed, that based on the attractions studied within this waterpark, the multiuse pool attracted the greatest number of users and also generated the greatest amount of moderate to vigorous physical activity levels. Youths ages 13–18 years spent much of their time being sedentary by standing on the waterslide stairs waiting to use the attraction instead of being more active at another attraction. Data for youths 4–12 years of age revealed they more equitably distributed their time and activity across waterpark attractions than did youths ages 13–18 years. From an Ecological Systems Theory perspective, this observation indicated that this waterpark design afforded more moderate to vigorous physical activity by younger youth and less by adolescents.

Results from the study indicated that attractions providing a greater number of opportunities for engagement also afforded greater opportunities for physical activity. If promoting moderate to vigorous physical activity is a major goal of waterpark design, attention should be paid to creating spaces and attractions with multiple levels of use and complexity that afford participation by youth of all ages.

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