Energy Expenditure Associated With the Use of Neighborhood Parks in 2 Cities

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Context: Availability of public neighborhood parks is associated with physical activity. Little is known about how parks contribute to population energy balance. **Purpose:** This study estimated energy expenditure associated with the use of neighborhood parks and compared energy expenditure by activity areas within parks and by neighborhood race/ethnicity and income. **Design:** The System for Observing Play and Leisure Activity among Youth (SOPLAY), a direct observation approach, was used to estimate energy expenditure in 10 Tampa (Florida) parks and 19 Chicago (Illinois) parks. **Setting:** Parks were selected from census tracts with a moderate to high representation of white, Latino, and African American populations. **Participants:** A total of 9454 park users were observed. **Outcome:** Sedentary, moderate, and vigorous activities were assigned metabolic equivalence intensity (MET) values of 1.5, 3, and 6, respectively. **Results:** Park use in Tampa generated 15 336 total METs over the study period. Chicago parks generated 7305.6 METs. Mean METs varied by activity areas in parks. For Chicago parks, mean METs were higher for parks in African American and higher-income neighborhoods. **Conclusions:** Public parks can contribute to population energy balance. Policies to make parks available, promotions to encourage park use, and programs to encourage active use of parks are necessary to achieve this potential.

KEY WORDS: energy expenditure, physical activity, population energy balance, public parks

Most children and adults in the United States do not get recommended levels of physical activity.[1] Physical inactivity is a risk factor for obesity and other chronic diseases and psychological disorders.[2] Recent estimates show that physical inactivity was the fourth leading cause of preventable death in the United States.[3] Therefore, increasing physical activity in the US population remains an important priority, especially in minority and lower-income groups where access to parks and recreational facilities might be limited.[4] Consensus exists among major health organizations such as the "Institute of Medicine and Healthy People 2020" on the potential of the built environment including public parks to influence physical activity.[2,5]

Park availability,[6] proximity,[5-9] and specific recreation facilities[9-11] are associated with increased physical activity. However, little is known about park's contribution to population energy balance.[12] For parks to influence physical activity at the population level, 3 conditions are necessary. Parks must be available, properly equipped, and well attended, and users must be active.[13] Furthermore, physical activity in parks might be used to represent levels of participation in physical activity by their surrounding population. The objective of this study was to estimate energy expenditure associated with the use of neighborhood parks and compare levels of observed physical activity in parks from neighborhoods of different racial-ethnic and income composition.

Observed estimates of community-level energy expenditure in parks would help quantify the health value of public parks. By providing estimates of energy expenditure for parks, the contribution of parks and their use to population energy balance can be objectively characterized. This can inform positioning of park and recreation services as components of the health care system.[14] The study extends previous

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research in 2 ways. First, energy expenditure in a larger sample of parks across 2 cities was examined. Second, energy expenditure was compared by racial/ethnic and income composition of neighborhoods where parks are located.

Methods

Data were obtained using a modified System for Observing Play and Leisure Activity among Youth (SOPLAY) to include adult participants.[15,16] At the time of the study, System for Observing Play and Recreation in Communities was not developed, but reliability results from this version SOPLAY were high.[17,18] SOPLAY requires periodic observational scans of individuals in predetermined zones. Pairs of trained observers coded park behaviors in 1 of 3 levels: sedentary, moderate, and vigorous activity. Prior studies established the reliability and validity of SOPLAY for measuring physical activity.[19,20] Energy expenditure was estimated as metabolic equivalence intensity (MET). Following earlier studies,[8,21] MET values of 1.5, 3, and 6, respectively, were assigned to park users observed in sedentary, walking, or vigorous activity.

Observations were conducted in 10 neighborhood parks in Tampa, Florida, and 19 parks in Chicago, Illinois, in designated activity areas (fields, courts, open areas, shelters, and playgrounds). For each park, 4 scanning periods were conducted for each activity area (2 from 10 AM to 12 PM and 2 from 1 to 6 PM). Observers recorded park users' activity from (Friday to Sunday) during the spring (Tampa: March-April) and early summer (Chicago: May-June) of 2005. Kappa coefficients for physical activity coding ranged from 0.79 to 0.97, well within the acceptable range.[22]

Park data were aggregated and summarized to obtain the total number of observed users per park, total METs per-park, and mean METs per-park-per-user. METs per-person-per-park were calculated by dividing total METs by the total number of participants in each park. Metabolic equivalence intensity per-user-per-acre was obtained by dividing total METs per-person-per-park by size of the activity zones (acres). METs per person living within 0.5 miles were obtained by dividing total METs by the population living half a mile from each park. Population buffer areas within 0.5 miles of a park were obtained using US Census data (SF3). This distance represents a standard distance in the literature for how far people can be expected to walk for urban services[23] and park use.[24]

Parks were identified for the study using ArcGIS 9.0, 2002 US Census Files at the block level. Parks within a 0.5-mile buffer area for predominantly (>50%) white (non-Hispanic), African American (black, non-Hispanic), and Hispanic neighborhoods were selected. The 2000 US Census Summary File 3 (SF3) at the tract level were used to identify parks within a 0.5-mile buffer area for low-income (less than the median with 30% or more poverty) and upper-/middle-income (above the area median with less than 10% poverty) neighborhoods.

Analysis of variance (SPSS, Version 17) compared overall METs by park and by race and income composition of the neighborhoods where the parks were located. Data collection procedures were approved by a university institutional review board.

Results

Tampa parks had 7112 observed users during the study period that ranged from 0 to 248 users per day per park with a mean of 55 (Table). The total number of observed users per acre per day ranged from 0 to 37 with a mean of 14.3. Tampa park users generated an overall count of 15 336 METs. Mean METs per park in Tampa varied considerably with a mean of 1.58 METs per person per park and a range from 0 to 2.57 ($F = 9.15$, $P < .001$). Thus, overall METs generated by Tampa parks corresponded to sedentary and light-intensity activities (eg, sitting, relaxing, talking, eating).[16] METs per-user-per-acre had a mean of 0.52 and ranged from 0 to 1.10. Tampa parks located in higher-income neighborhoods had higher METs per user than parks in lower-income neighborhoods ($F = 4.643$, $P < .05$). Tampa park zones (shelters, courts, and playgrounds) showed significant difference between METs levels ($F = 223.33$, $P = .000$), with only fields and open areas not differing significantly from each other.

In Chicago parks, 2402 users were observed. Over the study period, the number of observed users ranged from 0 to 385 users per-day-per-park with a mean of 11 users per day. Total user per-acre-per-day ranged from 0 to 7 with a mean of 1.84. Chicago parks generated a total MET accumulation of 7305.6 with a mean of 2.28 METs per-person-per-park and a range from 0 to 3.59 ($F = 10.73$, $P < .000$). METs for Chicago parks corresponded on average to moderate-intensity activity levels (eg, walking, bending down slowly, stretching). The mean METs per-user-per-acre was 0.42 and ranged from 0 to 0.79. Park users in African American Chicago neighborhoods had significantly greater METs than parks in Hispanic or white (non-Hispanic) neighborhood ($F = 5.027$, $P < .01$). Higher-income Chicago parks had higher mean METs than parks located in lower-income parks ($F = 9.621$, $P = .002$). For Chicago, only playgrounds and fields differed significantly from each other ($F = 3.581$, $P = .006$).

Table 1 ● Characteristics of Park Use, Park Characteristics, and Energy Expenditure in Tampa and Chicago Study Parks

	Number of Users	Users Per Day	Size in Acres	METs	METs Per Person Per Park	Population Living at 0.5 Mile	METs Per Person Living Within 0.5 Mile
Tampa park type							
Hispanic HI	3229	248	7.53	7 264.50	2.25	7 115	1.02
AA LI	1081	83	2.27	2 283.00	2.11	7 421	0.31
Caucasian HI	1056	81	3.3	2 091.00	1.98	7 092	0.29
Hispanic LI	715	55	1.81	1 420.50	1.99	4 436	0.32
Caucasian HI	633	49	5.94	1 504.50	2.38	7 940	0.19
AA LI	249	19	2.9	639	2.57	11 ,372	0.06
Caucasian LI	40	3	2.44	81	2.03	7 584	0.01
Caucasian LI	27	2	4.11	71.5	2.65	4 924	0.01
AA HI	0	0	2.67	0	0	2 729	0
AA HI	0	0	15.31	0	0	1 242	0
Total	7030	54[a]	48.28	15 355.00	1.79[a]	61 855	0.22[a]
Chicago park type							
Caucasian LI	385	32	7.44	1 113.00	2.89	40 007	0.03
Caucasian HI	280	23	7.11	777	2.78	26 143	0.03
Hispanic LI	258	22	5.89	664.5	2.58	29 493	0.02
Caucasian HI	217	18	9.11	618	2.85	36 985	0.02
AA HI	183	15	2.28	329.1	1.8	19 888	0.02
Hispanic HI	180	15	6.56	442.5	2.46	22 811	0.02
Hispanic LI	173	14	7.32	511.5	2.96	58 502	0.01
AA LI	159	13	4.89	424.5	2.67	23 579	0.02
Hispanic HI	156	13	8.47	559.5	3.59	9 939	0.06
AA LI	115	10	5.28	289.5	2.52	15 397	0.02
AA HI	74	6	5.28	184.5	2.49	14 860	0.01
AA HI	68	6	4.54	211.5	3.11	26 185	0.01
Caucasian LI	60	5	4.81	130.5	2.18	5 253	0.02
AA LI	54	5	7.3	175.5	3.25	22 627	0.01
Caucasian LI	38	3	5.63	111	2.92	6 342	0.02
Hispanic LI	2	0	2.84	4.5	2.25	9 135	0
AA LI	0	0	7.31	759	0	20 511	0.04
Hispanic HI	0	0	5.75	0	0	26 268	0
Caucasian LI	0	0	3.48	0	0	7 231	0
Total	2402	11[a]	111.29	7 305.60	2.28[a]	421 156	0.02[a]

Abbreviations: AA, African American; HI, high income; LI, low income; MET, metabolic equivalence intensity.
[a]Average.

● Discussion

This study illustrated the potential contribution of parks to energy balance in urban communities by estimating energy expenditure generated by park use in 2 different cities. Energy expenditure varied considerably by park and by the racial and income composition (race and income for Chicago and income only for Tampa) of neighborhoods where parks were located. A striking finding was the difference between cities in mean METs per person living 0.5 miles from a park (Chicago = 0.02, Tampa = 0.22).

Park attendance in Tampa was higher than that in Chicago, resulting in higher levels of overall METs. Chicago park users were substantially more active (mean = 2.28) than Tampa park users (mean = 1.58).

Although major health organizations identify public parks as spaces within communities to promote physical activity,[25,26] some parks may be underutilized within the community.[9] To realize physical activity benefits, parks must be used by a substantial number of active people. For example, at current user-activity levels, to increase METs associated with a park (see Table 1, park 6) from 0.06 to 3 (moderate intensity) would

require an additional 13 000 park users. In contrast, a combination of increased usage and energy would be required to achieve moderate-intensity benefits. Policies to make parks available and programs to encourage park usage are recommended to achieve this potential.

Three limitations of this study should be mentioned. First, park observations were limited to weekend days in late spring and summer months and do not represent other time periods. Thus, the physical activity benefit may be greater than illustrated. Second, residents living in proximity to the parks were not interviewed about their park use. Hence, the extent of park use in the neighborhoods is not known. However, existing research suggests that people living in close proximity to parks use them and are more active than people living farther away.[9,21-23,27-29] Third, energy expenditure was not directly assessed. The validity of the SOPLAY physical activity codes has been established, however.[19,20,30] Potential contributions of the study include focus on a large number of parks, comparisons by racial-income characteristics, and illustration of parks contribution to energy balance at the neighborhood level. Future studies should examine underlying race-income disparity in park use and energy expenditure. Larger samples of parks are also needed.

Conclusions

Public parks represent relatively low-cost investments that provide health benefits to a wide spectrum of the population. Park and recreation departments and public health professionals should undertake marketing campaigns to promote increased park attendance and active use of neighborhood parks. Moreover, investments are needed to maintain facilities and programs most likely to generate increased energy expenditure.

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