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Residential Environment for Outdoor Play Among Children in Latino Farmworker Families

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Abstract Child health and development benefit from physical activity. This analysis describes the residential play environment for children aged 2–4 years in farmworker families, their parent-reported levels of play and media time, and the association of residential environment with play and media time. Mothers with a child aged 2–4 years in farmworker families (n = 248) completed interviews over 2 years. Outcome measures were daily outdoor play time and media time. Measures of the residential environment included physical and social components. The mean min/day for outdoor play was 81.8 (SD 57.3) at baseline, 111.4 (SD 90.1) at year 1 follow-up, and 103.6 (SD 76.2) at year 2 follow-up. The mean media min/day at baseline was 83.8 (SD 64.3), 93.7 (SD 80.3) min/day at year 1 follow-up, and 59.9 min/day (SD (45.6) at year 2 follow-up. One additional person per bedroom was associated with 6 fewer min/day with media. The addition of each age appropriate toy was associated with an additional 12.3 min/day of outdoor play. An additional type of inappropriate media was associated with 6.8 more min/day with media. These results suggest changes to the residential environment to improve physical activity among children in Latino farmworker families.

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Introduction

Child health and development benefit from physical activity [1, 2]. Residential physical and social environments affect child physical activity by providing opportunities and barriers for active play (e.g., safety spaces and play equipment vs crowded homes and busy streets), as well for sedentary behavior (e.g., televisions and computer games) [3, 4]. Inappropriate media use, such as viewing television during meals or in a bedroom, increases the risk of sedentary behavior [5, 6]. Research has generally examined the association of residential physical and social environments on the physical activity of children aged 6 years and older (6–11 years) [4, 7], and those living in urban communities [3, 8], although some results for younger, rural children are now available [9–11].

Latino communities are of particular concern for understanding factors affecting child physical activity. Latino children have high rates of overweight and obesity [12, 13]. At the same time, physical activity among Latino children is far below recommended levels [14, 15]. Less than one-quarter of Latino and African American children aged 9–12 years in Houston, Texas, met moderate to vigorous physical activity guidelines [15] with 19 % of 4–6 grade Latino children in Philadelphia achieved the desired amount of physical activity [14].

Children of Latino farmworkers are no exception to the high rates of obesity and limited physical activity among Latinos residing in the United States [10, 16–18]. Of preschool and elementary school aged children (mean age of 6.4 years, Standard Deviation (SD) 3.2) in Florida Latino

farmworker families, 27.0 % were obese and 20.1 % were overweight [16]. Nichols et al. [16] reported that, of 2–5 year old children in Georgia Latino farmworker families, 10.2 % were overweight and 18.2 % were obese; of children 6–11 years, 21.2 % were overweight and 29.4 % were obese, and of children 12–19 years, 16.8 % were overweight and 31.6 % were obese [16]. Nineteen percent of 4 and 5 year olds in North Carolina Latino farmworker families were overweight and 28.5 % were obese [19]. Obesity is greater among Latino farmworker children compared with all children and Mexican–American children participating in NHANES [17]. Accelerometer data accessing the physical activity of Latino farmworker children aged 3–5 years indicates that they spend 6.2 h/day being sedentary and only 6.0 min/day engaged in moderate to vigorous physical activity [18], with little change in physical activity over a 2 years period [10].

Farmworkers are a vulnerable population in the United States (US) with limited access to healthcare [20, 21]. They are largely Latino immigrants, most from Mexico, who are often undocumented, with limited educational attainment, and low incomes [22]. Most farmworkers live in houses and neighborhoods that do not provide a physical or social environment conducive to child physical activity [9, 23–28]. The houses are often in very poor condition, limiting child physical activity; and their locations, often near farms, make outside play dangerous due to the presence of machinery, sharp tools, pesticides, and large animals [29]. They are generally located in rural communities with few amenities [30]. As parents are often undocumented (e.g., Arcury et al. [19, 27] report that only 15 % of families had at least one parent with proper documents), they are often unwilling to make unnecessary trips to parks for recreation so that they do not risk potential detection and deportation.

This analysis has three specific aims. It describes the residential physical activity environments (physical and social) for young children (age 2.5–3.5 through 4.5–5.5 years) in farmworker families over 2 years. It describes parent-reported levels (minutes) of sedentary (media) time and active (play) time of these children. Finally, it examines the association of residential physical and social environments with sedentary and active time among these children.

Methods

This analysis uses data collected for "Niños Sanos," a longitudinal investigation of child health and development in North Carolina Latino farmworker families. The study was approved by the Wake Forest School of Medicine Institutional Review Board, and it obtained a Certificate of Confidentiality from the National Institutes of Health. All participants provided signed informed consent.

Participants

We recruited women in Latino farmworker families with a child of 2 or 3 years of age. Families had at least one adult member employed as a migrant or seasonal farmworker in the previous year. A seasonal farmworker is an individual employed full-time in agriculture on a seasonal basis; a migrant farmworker is a seasonal farmworker who changes residence for employment. We used a multi-pronged, site-based sample design to identify and recruit participants [31]. "Sites" are organizations or locations with which members of the target community are associated. Site categories (and number of sites within each category) were: Head Start and Migrant Head Start Programs (7); migrant education programs (15); community health centers (4); Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) (1); community partner non-profit organizations serving Latino immigrants (2); and stores, churches, and events serving predominantly farmworkers (7). In addition, door-to-door recruiting was undertaken in Latino neighborhoods and farmworker camps. Community interviewers contacted families from previous Latino health studies and from personal networks.

We recruited 248 participants (mother–child dyads) over 13 months (April, 2011, through April, 2012), and completed data collection over 25 months (April, 2011, through April, 2013). The recruitment design did not allow us to obtain precise figures to calculate refusal or participation rates. It was not possible to know if those refusing to release information were eligible. Organizations may have compiled incomplete lists from their participants, and potential participants could easily have avoided contact at events.

Participants completed quarterly interviews for 2 years (total of 9 interviews: baseline and 8 quarterly follow-ups). Data for this analysis are taken from the baseline, 1 year follow-up (fourth quarter), and 2 years follow-up (eighth quarter) interviews. Of the initial sample of 248 participants, 223 (89.9 %) completed the 1 year follow-up, and 221 (89.1 %) completed the 2 years follow-up. A greater proportion of those lost to follow-up were in migrant farmworker families (15 of 68, 22.1 %) than in seasonal farmworker families (12 of 180, 6.7 %) [26].

Data Collection

Native Spanish-speaking community interviewers contacted participants. The trained interviewers explained the study, including its requirements and incentives, screened for inclusion/exclusion criterion, and asked the family to

participate. Willing participants provided signed informed consent, and completed the baseline interview. Interviews at baseline, 1 and 2 years were completed in the participants' homes or another location determined by the participant. Interviews were completed in Spanish (additional interviews were also completed at quarterly intervals across the 2 years, but these data are not included in this analysis). Participants received $10 for completing each interview.

At the time of each interview, participants completed three 24-h diet recalls during a 7-day period, including 1 weekend day and two weekdays using the Nutrition Data System for Research (NDS-R) software (Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN) developed by the Nutrition Coordinating Center at the University of Minnesota, which uses the multiple-pass method [32]. One component of the 24-h recall includes asking the number of minutes the child was involved in four activities during the morning, afternoon, and evening of the previous day, including watching TV, playing video or computer games, playing at a park or playground, and playing in the yard. Participants were given an incentive of $1 for each completed recall. Interviewer training and quality assurance review of randomly selected recalls was provided by the Diet, Physical Activity and Body Composition Core of the UNC-CH Nutrition Obesity Research Center, Anna Maria Siega-Riz, Ph.D., Director.

Measures

The two outcomes for this analysis are daily outdoor play time and daily media time. These measures are based on items included in NDS-R. Two items addressed outdoor play time: how many minutes the child spent playing at a park or playground; and how many minutes the child spent playing in the yard. Two items addressed media time: how many minutes the child spent watching TV; and how many minutes the child spent playing video or computer games. Each item asked about the time the child spent on each play activity and each media activity during the morning, afternoon, and evening of the previous day. Response options were: 0, 1–15, 16–30, 31–60, and $\geq$60 min. For each time of day, we recoded the measure as 1 = 0 min, 2 = 15 min, 3 = 30 min, 4 = 60 min, and 5 = 90 min and then summed the recoded measures for morning, afternoon, and evening to obtain a total time spent on the activity for the entire day. We measured time spent on these activities over 3 days and computed the 3-day average for each of the four activities. We calculated media time by summing the 3-day average time spent watching TV and the 3-day average time spent playing video or computer games. Outdoor play time was calculated by adding the 3-day average time spent playing at a park or playground and the 3-day average time spent playing in the yard.

Measures of the physical activity environment included physical and social components. Physical environment components included number of persons per bedroom, an indicator of crowding. Inappropriate media is having a TV in view at meals and having a TV in the child's bedroom, with the values of 0, 1, or 2. Age appropriate play equipment is having large rubber ball, soccer ball, and bean bags that are available in the home or yard, with the values of 0, 1, or 2. Social environment components included limiting screen time and parent support of play. Limiting screen time is based on four questions in which the participant indicated how often she limited the child's time watching television and playing video or computer games on week days and weekend days, with the 5 values never (1) to always (5). Scores were summed and divided by the number of questions for which a valid response was provided. Scores range from 1 to 5. Parent support for play is based on two questions in which the participant indicated how often she took the child to outdoor places spaces (like a park, playground, swimming pool, swim beach, walking trail or bike trail) and to indoor play spaces (like McDonalds play land, indoor swimming pool, roller skating or ice skating rink, a gymnasium, or indoor play areas like Bounce U) in the past 3 months. Both items had the values of never (0), less than once a week (1), once a week (2), and more than once a week (3). The two items were summed to form a frequency of play spaces score that ranged from 0 to 6 for use in multivariate analysis.

Child characteristics included in the analysis are sex and age at baseline (2 or 3 years). Mother characteristics reported include age (in the categories 18–25, 26–35, and 36–45 years), education (0–6, 7–9, and 10 or more years), whether married (or living as married), whether either participant or her partner had documents to be in the US, and years in the US (<5, 5–9, 10 or more).

Analysis

Frequencies and percentages are presented for demographic characteristics at baseline and residential environment characteristics at baseline and the ends of years 1 and 2. Mixed effects models predicting outdoor play time and media time were estimated using PROC MIXED in SAS v. 9.4 (Cary, NC). These models assumed an unstructured covariance matrix and included repeated measures that were clustered by participant. All statistical tests use a 5 % significance level.

Results

Participants

Fifty-two percent of children were female, with 52.8 % being 2 years old and 47.2 % being 3 years old (mean age

of 35.2 months, SD 5.8) at baseline (Table 1). Mothers ranged in age from 18 to 25 years (29.0 %), to 26–35 years (55.7 %), and 36–45 years (15.3 %). They had limited formal education with only 25.8 % having 10 or more years. Most (90.3 %) were married. Few (15.4 %) of the mothers or their partners had documents to be in the United States. Most (91.5 %) had been in the United States for at least 5 years.

Residential Physical Activity Environments

The residential physical activity environment remained consistent across the three times (Table 2). The proportion of residences with fewer than 2 persons per bedroom was about 35 %, and the proportion with 4 or more persons was about 6 %. The proportion with no inappropriate media was about 12 %, and proportion with 2 inappropriate media (TV in view at meals; TV in the child's bedroom) was about 40 %; the mean number of inappropriate media was 1.3 (SD 0.7) at each time. The proportion of residences with no age-appropriate play equipment (large rubber ball, soccer ball, or bean bags available in the home or yard) decreased from 19.8 % at baseline to 10.5 % at year 2, while the proportion with 2 or more increased from 56.7 % baseline to 63.2 % at year 2. The proportion limiting screen time (limiting child's time watching television and playing video or computer games) declined, with the proportion enforcing 1–2 limits increasing from 56.6 % at baseline to 67.3 % at year 2. The frequency of taking the child to outdoor play spaces (such as a park, playground, swimming pool, swim beach, walking trail or bike trail) also decreased, with the proportion reporting never taking child to outdoor play spaces increasing from 37.4 % at baseline to 48.9 % at year 2. The frequency of taking the child to indoor play spaces (indoor swimming pool, roller skating or ice skating rink, or a gymnasium) remained flat, with the proportion reporting never taking child to indoor play spaces being 46.3 % at baseline and 44.3 % at year 2. The mean for the taking child to play spaces score was 1.7 (SD 1.4) at baseline, but this declined to 1.3 at Year 1 (SD 1.3) and Year 2 (SD 1.2).

Reported Outdoor Play and Media min/day

The mean number of min/day mothers estimated their child playing in the yard or a park at baseline was 81.8 (SD 57.3). This estimate increased to 111.4 (SD 90.1) min/day at the year 1 follow-up, and to 103.6 (SD 76.2) min/day at the year 2 follow-up. The mean number of media min/day mothers estimated for their child at baseline was 83.8 (SD 64.3). This estimate increased to 93.7 (SD 80.3) min/day at the year 1 follow-up, and decreased to 59.9 min/day (SD (45.6) at the year 2 follow-up.

Associations of Residential Environment with Outdoor Play and Media min/day

The amount of outdoor play time increased over the two project years, with the amount of outdoor play time being 29.9 min/day greater at year 1 over baseline and 20.1 min/day greater at year 2 over baseline (Table 3). The amount of media time decreased by 21.8 min/day at year 2 compared to baseline. A 1 month increase in child's age was associated with a 1.0 min/day increase in play time; girls spent 11.2 fewer min/day with media than boys. The addition of each age appropriate toy was associated with an increase of 12.3 min/day of outdoor play time. A point increase in limiting screen time was associated with a 6.4 min/day decrease in outdoor play time. One additional person per bedroom was associated with spending 6 fewer min/day with media. An additional type of inappropriate media was associated with 6.8 more min/day with media.

Discussion

Consistent with previous studies [33], residential physical and social environments were associated with the levels of self-reported outdoor play time and media usage of young children in Latino farmworker families. Specifically, equipment (i.e., toys) availability was associated with meaningfully higher levels of outdoor playtime, which is consistent with a previously published study of preschool children [33], but inconsistent with earlier work in Mexican–American preschool children which showed no association between toy availability and physical activity [34]. However, there is a paucity of work in preschool children [35], Latino youth, or youth from rural communities [36].

The amount of time that mothers report these young children engage in outdoor play is substantial. At 81.8–111.4 min/day, these levels of physical activity are greater than that found in studies in older Latino children [14, 15]. Outdoor playtime is important, since it has been shown to be associated with higher levels of physical activity in preschool youth [35]. However, the measure used for the present study, as with many parental reports, may overestimate outdoor time [37]. Additionally, it is unknown if the children's outdoor time was spent in active or sedentary pursuits, so future studies should employ a combination of objective measurement (e.g., accelerometers) with parental questionnaires, which might capture contextual factors associated with physical activity [37, 38].

Mothers of children in the present study reported that the children engaged in considerably fewer min/day of media time (59.9 min/day at year 2 follow-up) than has previously been reported in similar samples of Latino youth

Table 1 Child and mother personal characteristics, Latino farmworker families, North Carolina at Baseline (2011–2012)

Child and mother characteristics	n	%
Child		
Sex		
Female	129	52.0
Male	119	48.0
Age (years)		
2	131	52.8
3	117	47.2
Mean months 35.2 (SD 5.8)		
Mother		
Age (years)		
18–25	72	29.0
26–35	138	55.7
36–45	38	15.3
Education (years)		
0–6	108	43.6
7–9	76	30.7
10 or more	64	25.8
Married or Living as Married	224	90.3
Either Participant or Partner Has Documents to Be in the United States	38	15.4
Years in United States		
< 5	21	8.5
5–9	108	43.9
10 or more	117	47.6

(150 min/day) [39]. However, baseline levels (83.8 min/day) are troubling in light of the American Academy of Pediatrics recommendations that children <2 years avoid media exposure and that children ≥2 years be limited to <1 h of media time [40]. These recommendations are especially important for Latino youth of migrant families, as screen time is associated with poor language development in Latino toddlers [39].

The amount of time mothers reported that their children engage in outdoor play (81.8–111.4 min/day) is far greater than the 6.0 min/day of moderate to vigorous physical activity (MVPA) measured for these same children with accelerometry [18]. This same study [16] found that they spent 6.2 h/day (369 min) being sedentary. Part of this discrepancy may be due to differences in the construct being measured, specifically "outdoor play" in the present study versus MVPA in the Grzywacz et al. [18] study. One would expect these two constructs to be correlated, since previous research has suggested that preschool children are more active when playing outdoors, and increasing outdoor time is associated with increased MVPA in youth [41, 42]. However, intervention research in Latino preschool children has shown no increase in MVPA when given 60 additional min/day of outdoor playtime compared to children not receiving the additional outdoor play time [43].

Reported min/day of physical activity increased with age. This is consistent with the developmental trajectory of children in early childhood [44], which results in increased physical activity as children's sleep patterns mature and motor skills increase. Children's physical activity tends to increase from preschool to early school age (6–11 years), declining precipitously in middle and high school [45].

One result of this study is inconsistent. A one point increase on the limiting screen time scale (with higher meaning more limits) was associated with a 6.4 min decrease in play time. This inconsistent result may be due to multiple confounding effects; it could be that limiting screen time was used more often with younger children, and younger age is associated with less play time.

This research should be evaluated in light of its limitations. Participants were recruited from a single state. The sample, although it may be representative of farmworker families in North Carolina, is not random. Therefore, generalizations should be made with caution. All measures are based on self-reports and are brief, which may be biased due to recall and social desirability. The manner in which the measure of outdoor play time was calculated (using the upper bound of each category rather than the mid-point of each category) may over estimate the amount of outdoor play time.

Table 2 Residential environment characteristics latino farmworker families, North Carolina

Residential environment characteristics	Baseline N = 248		Year 1 N = 223		Year 2 N = 221	
	N	%	N	%	N	%
Persons per bedroom (Crowding)						
Fewer than 2	94	38.1	75	33.6	80	36.2
2 to fewer than 3	94	38.1	95	42.6	88	39.8
3 to fewer than 4	40	16.2	39	17.5	39	17.6
4 or more	19	7.7	14	6.3	14	6.3
Inappropriate media						
0	31	12.6	26	11.7	26	11.8
1	113	45.9	109	48.9	98	44.5
2	102	41.5	88	39.5	96	43.6
Age appropriate play equipment						
0	49	19.8	37	16.7	23	10.5
1	58	23.5	62	27.9	58	26.4
2 or more	140	56.7	123	55.4	139	63.2
Limiting screen time						
1 to fewer than 2	133	56.6	149	67.4	146	67.3
2 to fewer than 3	50	21.3	28	12.7	20	9.2
3 to fewer than 4	32	13.6	34	15.4	37	17.1
4–5	20	8.5	10	4.5	14	6.5
Frequency of visits to outdoor play spaces						
Never	92	37.4	130	58.3	108	48.9
Less than once a week	90	36.6	58	26.0	87	39.4
Once a week	41	16.7	24	10.8	22	10.0
More than once a week	23	9.3	11	4.9	4	1.8
Frequency of visits to indoor play spaces						
Never	114	46.3	107	48.0	98	44.3
Less than once a week	100	40.7	81	36.3	105	47.5
Once a week	26	10.6	31	13.9	15	6.8
More than once a week	6	2.4	4	1.8	3	1.4
Frequency of visits to play spaces score						
0	68	27.6	72	32.3	72	32.6
1	40	16.3	67	30.0	56	25.3
2	86	35.0	51	22.9	65	29.4
3	24	9.8	16	7.2	17	7.7
4	19	7.7	12	5.4	8	3.6
5	3	1.2	1	0.4	0	0.0
6	6	2.4	4	1.8	3	1.4

Even with these limitations, these results have implications changing the residential environmental to improve physical activity among children in Latino farmworker families. These efforts may benefit by making age appropriate toys available to these children. Reducing inappropriate media (televisions in bedroom or in view during meal times) may also reduce media time for these children. Latino preschool children engage in more TV time than non-Latino white preschool children, and that having more TVs available in the home is associated with more TV time [46, 47].

Although one might expect substantial outdoor physical activity among people, such as farmworkers in rural communities, this is not the case. Many rural areas, particularly those on and near farms, have hazards that preclude physical activity [9]. Rural areas have limited environmental supports for physical activity [48], and most lack safe spaces (e.g., parks) where parents can take

Table 3 Multivariate Models of Outdoor Play Time and Media Time, Latino Farmworker Families, North Carolina

Predictor	Outdoor play time (min/day)			Media time (min/day)		
	B	SE	*P* value	B	SE	*P* value
Year 1 (Reference: Baseline)	29.9	6.9	0.000	11.9	6.1	0.053
Year 2 (Reference: Baseline)	20.1	6.0	0.001	−21.8	4.5	0.000
Female (Reference: Male)	1.7	5.9	0.769	−11.2	5.6	0.047
Q0 Age (Months)	1.0	0.5	0.049	0.5	0.5	0.266
People per Bedroom	2.5	3.1	0.427	−6.0	2.7	0.029
Number of Inappropriate Media	3.6	4.0	0.381	6.8	3.4	0.044
Number of Age Appropriate Play Toys	12.3	3.6	0.001	−5.2	3.2	0.105
Limiting Screen Time Score	−6.4	2.7	0.016	0.6	2.2	0.778
Frequency of Visits to Play Spaces Score	1.7	2.0	0.412	3.2	1.7	0.071

preschool children for active play [36]. This can manifest in parents keeping youth indoors where they are more likely to be sedentary [48]. As children age and desire more organized activities or those requiring facilities (e.g., soccer), this urban–rural disparity in activity supportive resources may manifest in lower levels of physical activity in rural youth [8]. As such, rural specific strategies for the promotion of physical activity are warranted [36], especially for rural, Latino children who are at greater risk for insufficient physical activity.

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Compliance with Ethical Standards

Conflict of interest The authors declares that they have no conflicts of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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