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Feasibility Study to Simultaneously Objectively Assess Activity and Location of Hispanic-American Preschool Children

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Academic General Pediatrics
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Social Ecological model of child PA

CHILD

Motivations
Preferences
Skills

Family

Active commuting
Parent’s perceptions
PA toys
Friend’s activity
PA Sedentary behavior
Siblings activity

Community

Parents’ weight
Work demands
Recreational facilities
Neighborhood walkability
Green space
Culture

Adapted from Sallis, Ann Rev Pub Health 2006; Davison, Birch, Obes Rev, 2001
Hispanic Population

• United States: 16.3% Hispanic (↑ 43% in 10 years)

• Texas: 37.8% Hispanic (↑ 42% in 10 years) (US census, 2010)

• Health Disparities:
  - Hispanic preschoolers higher rates of overweight/obesity (27% vs. 33%) (*JAMA* 2012;)
  - Mexican American preschoolers less active than white (*Sallis* 1993)
Niños Activos Feasibility Study

• Test the feasibility of simultaneously objectively measuring the location and activity of preschool children in Houston, TX

1. Assess ability to recruit and obtain location and activity data on preschool children.

2. Assess the correlation of GPS data logger and parent-reported location diaries to identify the location of preschoolers in Houston, TX.

3. Explore identification of travel mode with GPS data.

4. Explore utilizing location and trip data to assess where Hispanic preschool children are more active.
Niños Activos Feasibility Study

• Hispanic preschool children (n=15)
• Children wore monitors for 24-36 hours
  - QStarz BT1000X GPS data loggers
  - Actigraph GT3X accelerometer
• Parent completed location diary for 12 hr
• Data processing-
  - PALMS: Physical Activity and Location Measurement System at UC San Diego
  - https://ucsd-palms-project.wikispaces.com/
Outcomes of Interest

1. Child wear time and % valid data for GPS and accelerometers for 12 hr period

2. Correspondence of GPS location to location recorded by parent in location log (Kappa statistic)

3. Correspondence of travel mode via GPS and diary (Spearman correlations)

4. Association of location and child activity (multi-level models)
Niños Activos Feasibility Study

• Hispanic preschool children (n=15)
  - 67% girls, age 4.7 years (0.8), 53% family income <$50K/yr
  - Type of residence
    • 53% single family homes
    • 34% apartments
    • 13% trailer homes

(1) GPS and accelerometers for 12 hr
  - GPS: 94.7% (sd 20.1) time with data
  - CSA: 12/15 with valid data + 1 re-wear
    • Mean 10.0 hours (sd 2.7)
(2) Correspondence of location from GPS (PALM’s) & diary

*No significant differences in minutes at each location by reporting method
(2) Correlation of time at location by GPS (PALM’s) & diary

<table>
<thead>
<tr>
<th>Locations</th>
<th>% agreement (SD)</th>
<th>Kappa (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child’s home</td>
<td>92.0 (6.9)</td>
<td>0.79 (0.18)</td>
</tr>
<tr>
<td>Other home</td>
<td>91.9 (20.0)</td>
<td>0.49 (0.50)</td>
</tr>
<tr>
<td>Store</td>
<td>97.1 (4.3)</td>
<td>0.78 (0.21)</td>
</tr>
<tr>
<td>Restaurant</td>
<td>99.5 (1.2)</td>
<td>0.84 (0.04)</td>
</tr>
<tr>
<td>Church*</td>
<td>99.2 (2.3)</td>
<td>0.45</td>
</tr>
<tr>
<td>Community center</td>
<td>99.9 (0.2)</td>
<td>0.99 (0.1)</td>
</tr>
<tr>
<td>Park</td>
<td>99.7 (1.0)</td>
<td>0.78 (0.22)</td>
</tr>
<tr>
<td>Other location</td>
<td>99.3 (1.3)</td>
<td>0.78 (0.17)</td>
</tr>
</tbody>
</table>

* Only 1 participant reported location
(3) Spearman correlations of time in travel mode via GPS (PALM’s) & diary

$0.65^*$

Trip detection: ≥ 30 m/min (min of 100 m and duration ≥ 180 seconds)
Vehicle speed cut-off: 40 km/hour
Walking speed cut-off: 2 km/hour

* $p < 0.01$
** $p < 0.001$
(4) Association of **Diary** location and child activity (CPM)

<table>
<thead>
<tr>
<th>Predictors</th>
<th>exp(b)</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Location (diary) ref: child’s home</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other home</td>
<td>1.36</td>
<td>0.51, 3.62</td>
<td>.539</td>
</tr>
<tr>
<td>Store</td>
<td>1.15</td>
<td>0.71, 1.86</td>
<td>.570</td>
</tr>
<tr>
<td><strong>Restaurant</strong></td>
<td>0.35</td>
<td><strong>0.22, 0.56</strong></td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Church</td>
<td>0.91</td>
<td>0.61, 1.37</td>
<td>.662</td>
</tr>
<tr>
<td>Community center</td>
<td>0.69</td>
<td>0.39, 1.22</td>
<td>.198</td>
</tr>
<tr>
<td><strong>Park</strong></td>
<td>1.77</td>
<td><strong>1.19, 2.64</strong></td>
<td>.005</td>
</tr>
<tr>
<td>Other locations</td>
<td>0.67</td>
<td>0.37, 1.21</td>
<td>.185</td>
</tr>
</tbody>
</table>
(4) Association of **GPS** location and child activity (CPM)

<table>
<thead>
<tr>
<th>Predictors</th>
<th>exp(b)</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location (GPS) ref: child’s home</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other home</td>
<td>3.24</td>
<td>0.95, 11.03</td>
<td>.060</td>
</tr>
<tr>
<td>Store</td>
<td>1.22</td>
<td>0.72, 2.08</td>
<td>.458</td>
</tr>
<tr>
<td><strong>Restaurant</strong></td>
<td>0.50</td>
<td>0.24, 1.00</td>
<td>.050</td>
</tr>
<tr>
<td>Church</td>
<td>1.74</td>
<td>1.22, 2.47</td>
<td>.002</td>
</tr>
<tr>
<td>Community center</td>
<td>0.76</td>
<td>0.43, 1.33</td>
<td>.331</td>
</tr>
<tr>
<td><strong>Park</strong></td>
<td>2.23</td>
<td>1.50, 3.31</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Other locations</td>
<td>0.72</td>
<td>0.35, 1.49</td>
<td>.382</td>
</tr>
</tbody>
</table>
(4) Association of mode of travel to child activity (CPM)

<table>
<thead>
<tr>
<th>Predictors</th>
<th>exp(b)</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trip (GPS) ref: no trip</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle</td>
<td>0.57</td>
<td>0.41, 0.84</td>
<td>.003</td>
</tr>
<tr>
<td>Walking</td>
<td>0.85</td>
<td>0.38, 1.87</td>
<td>.685</td>
</tr>
<tr>
<td><strong>Trip (diary) ref: no trip</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle</td>
<td>0.48</td>
<td>0.35, 0.66</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Walking</td>
<td>1.18</td>
<td>0.7, 1.60</td>
<td>.284</td>
</tr>
</tbody>
</table>
Conclusion Feasibility Study

1. Hispanic parents of 3-5 year old children willing
   - Children able to wear both monitors simultaneously
   - GPS data complete

2. Good correspondence for location

3. Moderate correspondence for mode of transportation using PALMS algorithms

4. Able to process simultaneous GPS and CSA data with associations of location and CPM identified
Limitation Feasibility Study

- Convenience sample
- Small sample
- Limited observed time
- Parent reported diary data at 5 minute intervals
- Limitations for detecting travel mode

Future Plans: Assess environmental and parental influences on Hispanic preschoolers PA
Acknowledgements

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- V. Cordova
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- J. Ellis

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Funding: NIH NICHD-1R21-HD060925
Questions?
Model of Environmental Influences on PA of Hispanic Preschoolers

Parent’s perceptions of neighborhood:
- Informal Social Control
- Community Cohesions
- Neighborhood Disorder
- Traffic Safety
- Active-play equipment availability

CULTURAL FACTORS
- Acculturation
- Ethno-cultural identity
- Familism

Parenting Practices

Child’s PA

Objective data
Perceived

SES

Neighborhood characteristics:
- Crime
- Traffic
- Parks/playground

Pediatrics
Feasibility Study to Simultaneously Objectively Assess Activity and Location of Hispanic-American Preschool Children

March, 2012

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Population Served:
Latino/Hispanic, Preschool Youth

Location by State:
Texas

Study Type:
Correlates

Description:
Presentation at the 2012 Active Living Research Annual Conference.

Background
Hispanic-American preschool children have higher rates of obesity and Hispanic-American youth may be at higher risk for sedentary lifestyles and metabolic syndrome. Both physical and social environmental factors influence young children’s physical activity. The ability to simultaneously capture objective measurement of physical activity and location of young Hispanic-American children will help provide more reliable and valid findings to better inform environmental interventions and policy changes to promote physical activity among young Hispanic-Americans.

Objectives
This pilot study aimed to 1) assess the usefulness and feasibility of simultaneously objectively measuring the location and activity of Hispanic-American preschool children; 2) evaluate the correspondence between parental diary data of location and travel behavior and Global Positioning System (GPS) data on preschool children’s location and travel behavior (presence, duration, and mode of travel) processed using the Physical Activity Location Measurement System (PALMS); and 3) examine the associations of travel mode (no travel, walking, and motorized travel) and location (child’s home, others...
home, store, restaurant, church, community centre, park, and other locations) with objectively measured physical activity (defined as accelerometer counts per 30 seconds).

**Methods**

Fifteen 3-5 year-old Hispanic-American children residing in Houston, Texas were recruited. Children simultaneously wore QStarz BT100X GPS data loggers and Actigraph GT3X accelerometers for a 24-36 hour period on a day they were with a parent the whole day, including a 12 hour run in time. The parent completed a location and travel behavior diary for 12 hours (8 AM-8PM), at 5 minute intervals. Physical activity and GPS data were processed using PALMS. For each participant, the levels of observation-by-observation correspondence between GPS- and diary-assessed locations and travel behavior were estimated with Kappa statistic and percent agreement. Whole-sample point estimates and relative 95% confidence intervals of Kappa statistics and percent agreement were computed. Between-method differences in total minutes spent on specific travel modes and location, aggregated at the person level, were estimated using paired t-tests and Wilcoxon signed-ranks tests. Between-method associations in total minutes spent on specific travel modes and location, aggregated at the person level, were estimated using Kendall’s tau correlation coefficient. Associations of travel mode and activity location with objectively measured physical activity were estimated using multilevel models.

**Results**

The average age of the children was 4.6 (sd 0.9), 60% were girls. Of the participating Hispanic-American families, 53% reported family income less than $50,000/year; and 53% lived in single family homes, 34% in apartments, and 13% in trailer homes. Eighty percent of the children had valid physical activity data with mean valid activity data of 10.0 hours (sd 2.7). GPS- and diary-based estimates of minutes at each location were positively correlated (Kendall’s tau >0.69) and mean values were not significantly different. The average correspondence between GPS- and diary-based estimates of types of location ranged from 91.9% to 99.9% agreement and Kappa statistics ranged from 0.45 to 0.99. No between-method differences in time spent in different modes of travel were observed. The between-method correlations of estimated participant-aggregated minutes spent on all trips and vehicle-based trips were moderate to strong. However, those related to walking trips and total trips were weak (<.38) and not statistically significant. The average observation-by-observation correspondence between GPS- and diary-based estimates of travel-mode ranged from 87.4% to 97.3% agreement and Kappa statistics ranged from 0.31 to 0.52. Children were significantly more active in parks and less active in restaurants compared with at home, when estimating locations by diaries as well as GPS monitors.

**Conclusions**

It is feasible to simultaneously measure and process GPS and accelerometer data on Hispanic-American preschool children. Good between-method correspondence was found for location and moderate correspondence was observed for mode of travel. Location was associated with different activity levels even in this small sample. The simultaneous use of GPS and accelerometers will be used by this team in larger studies to investigate where Hispanic-American preschool children are active.

**Support/Funding**

This project was funded by a R21 grant from NIH-NICHD (5R21HD060925).