VALIDATION OF A PARENTAL HEALTH LITERACY MEASURE IN A LONGITUDINAL COHORT OF YOUNG CHILDREN

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Low parental health literacy may be associated with worse health outcomes in children.

The validity and reliability of scales measuring health literacy and numeracy skills in parents have not been robustly examined.

Limitations to most health literacy assessments:

- Ceiling effect – not optimal for younger adults
- Not measuring the full construct of health literacy
  - Neglect oral literacy, numeracy, and navigational skills
The Parental Health Literacy Activities Test (PHLAT)

- Developed specifically to measure health literacy and numeracy in young adults
- Validated in a cross-sectional dataset of 182 English speaking and 176 Spanish speaking parents
- Shortened to 8-items
- Limited by sample size and lack of longitudinal data
GREENLIGHT INTERVENTION STUDY

- NIH-funded cluster randomized trial designed to evaluate the impact of a health communication/literacy intervention on early childhood obesity
  - Subsequent Greenlight Cohort
SPECIFIC AIMS

- Examine the validity and reliability of five different measures of health literacy and/or numeracy in parents of young children
  - Internal consistency reliability
  - Test-retest reliability
  - Construct validity
  - Predictive utility
STUDY DESIGN & INCLUSION CRITERIA

- Study design
  - Longitudinal cohort
  - 865 English- and Spanish-speaking families
  - Pediatric resident clinics at four academic centers
  - Followed from 2 months to 2 years
    - Additional subset followed to 5 years

- Inclusion criteria
  - Consent from a primary caregiver
  - Infant presents for 2 month well-child visit, age >6 & <16 weeks
  - Caregiver ability to speak English or Spanish
  - Agrees to bring child to visits until their 2 year visit
EXCLUSION CRITERIA

• Exclusion Criteria
  • Child exclusions:
    • Gestational age < 34 weeks
    • Birth weight < 1500 grams
    • Weight < 3rd percentile at 2 months of age
    • Diagnosis of failure to thrive, or weight down ≥ 2 percentile curves
    • Medical problems that may affect growth or diet
  • Caregiver exclusions:
    • Significant visual impairment, or mental or neurologic illness
    • Age <18 years
    • Plans to leave area during study period
STUDY INSTRUMENTS

- Health Literacy or Numeracy Scales
  - **PHLAT-8** 5-7 minutes to complete
  - Short Test of Functional Health Literacy in Adults (s-TOFHLA)
  - Newest Vital Sign (NVS)
  - Brief Health Literacy Screen (BHLS) by Chew et al
  - Wide Range Achievement Test (WRAT) - Arithmetic

<table>
<thead>
<tr>
<th>Baseline – 2 month old</th>
<th>6 month old follow up</th>
<th>9 month old follow up</th>
<th>24 month old follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHLAT-8</td>
<td>WRAT</td>
<td>NVS</td>
<td>PHLAT-8 (retest)</td>
</tr>
<tr>
<td>s-TOFHLA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BHLS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OUTCOME MEASURES

- Clinic show rate
  - Calculated at 2 years
  - # of actual visits / # of expected visits

- Parent’s feelings of internal locus of control over their child’s health
  - Measured at baseline and 2 years
  - Higher score reflecting higher sense of control
ANALYTIC PLAN

• Examine validity and reliability of the PHLAT:
  • Internal consistency reliability
    • Kuder-Richardson coefficient
  • Test-retest reliability
    • Spearman Coefficient
  • Construct validity
    • Spearman Coefficients with education, income, other literacy instruments
  • Predictive utility
    • Well child check-up show rate (calculated at 2 years)
    • Parental feelings of internal health locus of control
620 Excluded
65 Child age
47 Child with wt/ht <3rd percentile
60 Child <34 wk GE or BW<1500g
3 Child with Failure to thrive
35 Child with medical problem that may affect weight gain
2 Twins, neither eligible
93 Caregiver language
90 Caregiver age
53 Caregiver with known plans to move
3 Caregiver mental/neurological illness
18 Caregiver with poor visual acuity
232 Caregiver not agreed to return visits
6 Caregiver enrolled similar study
53 Resident not consented/trained
*all exclusions tallied for each individual

1912 Assessed for Eligibility
1206 English
209 Spanish
94 Other/Unknown

984 Eligible

307 Declined

119 Lost before approached

2 month WCC Enrolment (n=865)
English: 563/865 = 65%
Spanish: 302/865 = 35%
Complete Measures: 849/865 = 98.2%
2 mo PHLAT complete: 845/865 = 97.7%

24 month WCC Retained:
569/865 = 65.8%
*24 mo PHLAT complete: 240/865 = 27.7%

*convenience sample
## DEMOGRAPHICS

<table>
<thead>
<tr>
<th>Caregiver characteristics</th>
<th>Combined (n= 843) Mean (SD) or n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caregiver age, years</td>
<td>27.97 (0.38)</td>
</tr>
<tr>
<td>Mother</td>
<td>806 (96.6%)</td>
</tr>
<tr>
<td>Non-US born</td>
<td>421 (50.1%)</td>
</tr>
<tr>
<td>Spanish primary language</td>
<td>292 (34.6%)</td>
</tr>
</tbody>
</table>

### Race/ethnicity:

- Hispanic: 416 (49.4%)
- Black, Non-Hispanic: 238 (28.2%)
- White, Non-Hispanic: 154 (18.3%)
- Other, Non-Hispanic: 35 (4.2%)

### Education:

- Less than HS: 215 (26.5%)
- HS graduate/equivalent: 276 (32.9%)
- Some college: 199 (23.7%)
- College or greater: 150 (17.9%)
# DEMOGRAPHICS

## House characteristics

<table>
<thead>
<tr>
<th>Household Income ($)</th>
<th>Combined (n= 843) Mean (SD) or n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10,000</td>
<td>258 (31.8%)</td>
</tr>
<tr>
<td>10,000 – 19,999</td>
<td>223 (27.5%)</td>
</tr>
<tr>
<td>20,000 – 39,999</td>
<td>199 (24.5%)</td>
</tr>
<tr>
<td>&gt;= 40,000</td>
<td>131 (16%)</td>
</tr>
</tbody>
</table>

## Adults at home:

<table>
<thead>
<tr>
<th>Adults at home</th>
<th>Combined (n= 843)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 adult</td>
<td>85 (10.1%)</td>
</tr>
<tr>
<td>&gt;= 2 adults</td>
<td>755 (89.9%)</td>
</tr>
</tbody>
</table>

## Child characteristics

<table>
<thead>
<tr>
<th>Child age (weeks)</th>
<th>Combined (n= 843) Mean (SD) or n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.29 (0.06)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Female</th>
<th>433 (51.4%)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>WIC enrollment</th>
<th>127 (15.1%)</th>
</tr>
</thead>
</table>

## Child health insurance (Total: 840)

- Medicaid | 726 (86.4%) |
- Private  | 89 (10.6%)  |
- None     | 25 (3%)     |
## RESULTS – PHLAT QUESTIONS

<table>
<thead>
<tr>
<th>#</th>
<th>Question Description</th>
<th>% Correct baseline (n=845)</th>
<th>% Correct 24 mo (n=240)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Demonstrate how to make a 4 oz bottle using powder-based formula</td>
<td>88%</td>
<td>84%</td>
</tr>
<tr>
<td>2</td>
<td>Demonstrate how to make a 4 oz bottle using concentrated formula</td>
<td>33%</td>
<td>37%</td>
</tr>
<tr>
<td>3</td>
<td>Determine from an Ibuprofen container and medicine cap how many milliliters are in ½ teaspoon of medicine</td>
<td>61%</td>
<td>72%</td>
</tr>
<tr>
<td>4</td>
<td>Determine if vanilla wafers are safe to feed child based on nutrition label and list of child’s allergies</td>
<td>82%</td>
<td>88%</td>
</tr>
<tr>
<td>5</td>
<td>Read a liquid antibiotic prescription and demonstrate with a syringe how to administer a dose of the medicine</td>
<td>54%</td>
<td>59%</td>
</tr>
<tr>
<td>6</td>
<td>Calculate the number of 2 ounce servings in a 32-ounce can of juice</td>
<td>53%</td>
<td>51%</td>
</tr>
<tr>
<td>7</td>
<td>Determine by nutrition label if 100% fruit or vegetable juice, contains at least 30mg of Vitamin C per 100mL, or is 120% of the daily value</td>
<td>56%</td>
<td>55%</td>
</tr>
<tr>
<td>8</td>
<td>Reads and comprehends instructions regarding breastfeeding</td>
<td>51%</td>
<td>54%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Percentage (95% CI)</th>
<th>59.9% (58-62%)</th>
<th>62% (59-65%)</th>
</tr>
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<tbody>
<tr>
<td>English</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=528 at 2mo; n=159 at 24 mo)</td>
<td>(64.1-68%)</td>
<td>(63-70.8%)</td>
</tr>
<tr>
<td>Spanish</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=297 at 2 mo; n=81 at 24mo)</td>
<td>48.3% (45.3-51.1%)</td>
<td>52% (46.9-57.1%)</td>
</tr>
</tbody>
</table>
RESULTS - PHLAT CHARACTERISTICS

Table 3. PHLAT at Baseline – Psychometric Characteristics

<table>
<thead>
<tr>
<th>Reliability Coefficients</th>
<th>Spearmans (p-value)</th>
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<tr>
<td>Internal Consistency (KR-20):</td>
<td>0.66</td>
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<tr>
<td>Test-retest Reliability (n=233)</td>
<td>0.57 (&lt;0.001)</td>
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<th>Validity Coefficients</th>
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<td>S-TOFHLA (n=843)</td>
<td>0.49 (&lt;0.001)</td>
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<td>NVS (n=541)</td>
<td>0.55 (&lt;0.001)</td>
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<td>WRAT (n=684)</td>
<td>0.43 (&lt;0.001)</td>
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<td>Parent Education (n=845)</td>
<td>0.40 (&lt;0.001)</td>
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<tr>
<td>Household Income (n=812)</td>
<td>0.32 (&lt;0.001)</td>
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<tr>
<td>Parent Age (n=839)</td>
<td>0.01 (0.688)</td>
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<th>Predictive Utility</th>
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<tr>
<td>WCC Show rate (over first 2 years)</td>
<td>0.09 (0.013)</td>
</tr>
<tr>
<td>Parental internal locus of control beliefs</td>
<td></td>
</tr>
<tr>
<td>- 2 months (n=841)</td>
<td>0.41 (&lt;0.001)*</td>
</tr>
<tr>
<td>- 24 months (n=515)</td>
<td>0.29 (&lt;0.001)*</td>
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*Higher internal LOC associated with higher performance on PHLAT
### RESULTS- PHLAT CHARACTERISTICS

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#### Validity Coefficients

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CONCLUSIONS

• Poor health literacy is common in parents of young children

• PHLAT demonstrates good reliability and validity in parents of young children
  • Fair predictive utility when predicting well child check-up show rates and parental feelings of internal health locus of control
  • Valid in both English and Spanish
  • Preferable content and face validity in pediatric research
LIMITATIONS

• Respondents are mostly mothers with lower socioeconomic status, which may limit the generalizability

• Caregiver skills tested in a clinical setting, may not reflect everyday behaviors

• Potential confounding not addressed in these results
FUTURE DIRECTIONS

- The PHLAT could be useful as a marker to predict families with children at risk of poor health outcomes

- Additional sub-set of families followed through five years
  - Further analysis of predictive utility for the PHLAT
  - Could add to the predictive utility of the PHLAT, and strengthen utility as a tool to identify low-literacy families at risk of poorer outcomes

- Examine the validity, reliability, predictive utility of the other health literacy or numeracy instruments collected in this cohort (s-TOFHLA, NVS, BHLS, WRAT)
ACKNOWLEDGEMENTS

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  - NIH/NICHD R01 HD059794 (Perrin, Rothman, Sanders, Delamater, Yin)
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THANK YOU

• Questions?

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