### Input Quality Trumps Quantity Again: Low-income Fathers’ Wh-questions and Toddlers’ Vocabulary and Verbal Reasoning

Meredith L. Rowe¹, Kathryn A. Leech¹,², & Natasha Cabrera²

¹ Harvard University, ² University of Maryland

---

**Background**

Not all caregiver input is created equal:

- Input *quality* often trumps *quantity* (e.g., Cartmill et al., 2013; Rowe, 2012; Tomasetto & Farrar, 1986; Yu & Smith, 2012; Weizman & Snow, 2001).

One example of input *quality* is parents’ use of *wh*-questions:

- Children who hear more *wh*-questions (who, what, ...) are better at comprehending and producing their own *wh*-questions (Goodwin et al., 2014; Hoff-Ginsberg, 1985; Rowland et al., 2003; Vilan & Casey, 2003).

- Children who ask more *wh*-questions receive more causal explanations and reasoning from parents (Callanan & Oakes, 1992; Frazier et al., 2009).

- Mothers’ use of *wh*-questions relates to vocabulary in three-year-olds (Cristafaro & Tamis-LeMonda, 2012).

- Fathers’ linguistic input makes a unique contribution to child language (e.g., Pancsofar & Vernon-Feagans, 2010) and fathers use more *wh*-questions than mothers (Gleason, 1975; Mannie & Tomasetto, 1987; Rowe et al., 2004).

Research Questions:

1. Are there associations between fathers’ *quantity* and quality of speech and toddlers’ *verb* and *reasoning* skills?
2. Controlling for *quantity*, does fathers’ *wh*-questions predict *verb* or *reasoning*?
3. Does 24-month vocabulary mediate the association between fathers’ *wh*-questions and 36-month *verb* or *reasoning*?

---

**Method**

- 41 African-American fathers and their 24-month-old children
- Sampled from Early Head Start Research and Evaluation Project
- Low-income, English-speaking

**Procedure**

- Videotaped 10-minute semi-structured play interaction
- Mothers completed short form of McArthur-Bates Communicative Development Inventory (MCDI; Fenson et al., 2000)

**36-Months**:

- Researchers administered Bayley Scales of Infant Development
- Factor analysis used to create *verb reasoning* composite
- Example items: child asked to sort pegs by color; reason about relation between objects

---

**Participants**

- 41 African-American fathers and their 24-month-old children
- Sampled from Early Head Start Research and Evaluation Project
- Low-income, English-speaking

**Procedure**

- Videotaped 10-minute semi-structured play interaction
- Mothers completed short form of McArthur-Bates Communicative Development Inventory (MCDI; Fenson et al., 2000)

**36-Months**:

- Researchers administered Bayley Scales of Infant Development
- Factor analysis used to create *verb reasoning* composite
- Example items: child asked to sort pegs by color; reason about relation between objects

---

**Transcription and Measures**

**Transcription**

- Interactions transcribed at the level of the utterance using CHAT conventions of CHILDES (MacWhinney, 2000)

**Measures**

- *Input Quantity*: number of father utterances
- *Input Quality*: Utterances containing questions were reliably coded as *wh*-questions (what is that?) or other questions (is that the horse?)

- Used raw numbers as well as proportion measures created by dividing each question type by total utterances

---

**Results**

Fathers varied widely in both their *quantity* of talk (utterances) and *quality* of talk (*wh*-questions and other questions)

<table>
<thead>
<tr>
<th>Father Speech Input</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
<th>% Total Talk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utterances</td>
<td>220</td>
<td>67.8</td>
<td>66-378</td>
<td>66.11%</td>
</tr>
<tr>
<td>Wh-Questions</td>
<td>17.10</td>
<td>10.53</td>
<td>2-38</td>
<td>8.11%</td>
</tr>
<tr>
<td>Other Questions</td>
<td>32.1</td>
<td>16.9</td>
<td>3-74</td>
<td>14.17%</td>
</tr>
</tbody>
</table>

*Fathers’ *wh*-questions predict both children’s 24-month vocabulary and 36-month verbal reasoning with education and total utterances controlled*

**Conclusions**

- Within a low-SES sample, variability in the quality of verbal input (fathers’ *wh*-questions), but not input *quantity* (fathers’ utterances), was associated with children’s concurrent vocabulary skill and their verbal reasoning one year later.

- Fathers’ *wh*-questions might be particularly useful for *verb* because they more often elicit a verbal response from the child and these responses are more complex than responses to other questions.

- *Verb* may foster verbal reasoning in that it provides the tools (e.g., lexical items) children can use to manipulate concepts and facilitate reasoning skills across development (e.g., Gentner, 2003; Smith & Thelen, 2003).

- Interventions that focus on child-directed speech should encourage caregivers to use more *wh*-questions when interacting with toddlers.

---

**Selected References**


---

**Acknowledgments**

This research was supported by an NIH grant (R03 from NICHD: HD066017) to Natasha Cabrera and Meredith Rowe. We are grateful to Bridget Mullan for her administrative work on this project, and to Jenessa Malin, Elizabeth Karberg, Virginia Salo, Ran Wei, Simone Templeton, Jeff Wang, Sophia Castro, and Jennifer Anderson for help with transcription, coding and data processing.

---

**Transcript 1**

- 24-Month Vocabulary
- 36-Month Verbal Reasoning

<table>
<thead>
<tr>
<th>Standardized Betas</th>
<th>Father Years of Education</th>
<th>Father Number of Utterances</th>
<th>Father Number of Wh-Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-Month Vocabulary</td>
<td>-0.02</td>
<td>-0.42</td>
<td>0.47</td>
</tr>
<tr>
<td>36-Month Verbal Reasoning</td>
<td>-0.01</td>
<td>-0.25</td>
<td>0.37</td>
</tr>
</tbody>
</table>

R² (%): 28.3% 15.6%

*Scatter plots showing father education difference (A) proportion father *wh*-questions and child vocabulary; (B) proportion father *wh*-questions and child verbal reasoning; (C) child vocabulary and child verbal reasoning*

---

**Transcript 2**

Children’s responses were both more frequent and more complex to *wh*-questions than to other questions

---

**Research**

Children’s 24-month vocabulary mediates relation between the proportion of fathers’ utterances that are *wh*-questions and children’s 36-month reasoning skills

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
<th>36-month Reasoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Father <em>wh</em>-questions</td>
<td>24.56**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child <em>wh</em>-questions</td>
<td>197.71**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Father <em>other</em> questions</td>
<td>19.83</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Child’s responses were both more frequent and more complex to *wh*-questions than other questions*

---

**References**


---

**References**