

# Changes in Parental Input Patterns of Wh-Questions

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## 1. Introduction

Parental wh-questions (e.g., what, who, etc.) have been shown to play an important role in children's vocabulary development (e.g., Goldfield, 1993, 2000; Leech, Salo, Rowe, & Carbera, 2013; Ninio, 1980; Rowe, Leech, & Cabrera, 2016). They have many features of high-quality "word-learning situations" that promote vocabulary acquisition (Clark & Wong, 2002; Gaudreau, Puttre, Araneta, Kaliakan, Hirsh-Pasek, & Golinkoff, 2020; Rowe et al., 2016; Yu, Banawitz, & Shafto, 2019). Rowe et al. (2016) outline the mechanism through which wh-questions facilitate word learning. First, they encourage more verbal participation and demand more complex verbal responses than other queries such as yes-no questions. Second, they tend to be inscribed in rich sequences or "cycles" of interaction between the parent and the child. Generally, the parent asks a wh-question, to which the child may attempt a response, and the parent then provides feedback, corrects, or supplies the label if the child does not answer satisfactorily (Bornstein, Rahn, Galperin, Pecheux, Lamour, Toda, et al., 1992; Bornstein, Tamis-LeMonda, Hahn & Haynes, 2008; Clark & Wong, 2002; Ninio, 1980; Yu et al., 2019). Three things are happening. First, the question draws and leverages the child's attention toward a particular object or event. Then, the child has the opportunity to make the connection between words and their referents and rehearse his or her vocabulary. Finally, the parent gives informative and timely feedback, often offering the correct answer, all while the child's attention is still on the object or event in question. Therefore, these question-answer-feedback loops are an efficient way to build the child's vocabulary.

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In their detailed examination of how adults offer new words in child-directed speech in six English corpora in the CHILDES database (MacWhinney, 2000), Clark and Wong (2002) described three types of question-answer sequences featuring wh-questions: wh-question + answer (e.g., *What's this? Chair*), wh-question + *called* + answer (e.g., *What's that called? Dancing*), and wh-questions used for verbs only (i.e., *What is he doing? He is jumping*). They found that 88% of question-answer sequences in their data were used to offer nouns, and only 12% for verbs. Furthermore, offers of nouns in the form of question-answer sequence were introduced in each child's data earlier or at the same time as verb offers, suggesting that parental wh-questions, a rich type of input shown to promote productive vocabulary, appear to prioritize nouns over verbs and other word classes.

Goldfield (2000) reported that, over the course of 5-minute free-play sessions, English-speaking 20-month-olds' mothers elicited and reinforced production for nouns more than for verbs. Wh-questions were considered one of the main types of input considered as eliciting/reinforcing a verbal response and even 12-month-olds' mothers in her earlier study (1993) used questions and prompts to elicit nouns more often than verbs, although they asked only a few wh-questions overall. Based on her finding that only two out of 43 20-month-old children produced more verbs than nouns, while the other 41 children produced many more nouns than verbs, she argued that English-speaking mothers use questions and prompts to preferentially reinforce children's production of nouns over verbs, leading to a noun bias in early productive lexicon (Goldfield, 2000).

A noun bias in early productive lexicon in English and many other languages, except for some Asian languages, has been widely cited in literature (e.g., Bassano, 2000; Bassano, Eme, & Champaud, 2005; Bassano, Mailchon, & Aime, 1998; Bates, Marchman, Thal, Fenson, Dale, Resnik, Reily, & Hartung, 1994; Choi & Gopnik, 1995; Gentner, 1982; Nelson, 1973; Tardif, 1996). However, it has also been reported that English-speaking children show a much stronger prevalence of nouns over verbs in early productive lexicon compared to children learning other languages such as French and Japanese (Bassano, 2000; Bassano et al., 1998; Fernald & Morikawa, 1993; Ogura, 1999; Oshima-Takane, 2006). For instance, Bassano and her colleagues (2005) provided semi-structured interaction data indicating that French-speaking children's use of common noun types outnumbers action verb types from 20 to 39 months of age, although verb tokens become close to noun tokens by 39 months. Bassano and her colleagues (Bassano et al., 1998; Bassano, 2000; Bassano et al., 2005) argued that while French-speaking children show a noun bias, the discrepancy between nouns and verbs in their early vocabulary was smaller compared to English-speaking children. Fernald and Morikawa (1993) reported that the number of productive object nouns was larger for American infants than Japanese infants at both 12 and 19 months of age according to their mothers' report using the Japanese and English version of Bates Vocabulary Inventory. Ogura (1999) examined Japanese-speaking children's production of noun and verb types during 19-minute mother-child interaction at 21 and 24 months of age

and found a noun advantage only when proper names were counted in noun types, unlike English-speaking children.

There is also evidence that French- and Japanese-speaking parents ask their children significantly fewer questions than English-speaking parents (Bornstein et al., 1992; Fernald & Morikawa, 1993; Miyata, Oshima-Takane, & Nishisawa, 2003). For instance, Bornstein and his colleagues (1992) found that American mothers asked 13-month-old infants questions more frequently than French and Japanese mothers. Fernald and Morikawa (1993) reported that American mothers asked infants of 6, 12, and 19 months of age wh-questions more frequently than Japanese mothers. Similarly, Miyata et al. (2003), who analyzed longitudinal data of four mother-child pairs from 14 to 24 months of age, found that, while Japanese mothers used noun-eliciting wh-questions more often than verb-eliciting ones, their overall use of wh-questions was extremely low. Although these findings seem to suggest a link between mothers' frequent noun-eliciting wh-questions and children's strong noun bias in early productive vocabulary, no studies have investigated whether parental wh-questions and prompts facilitate children's noun and verb production by the mechanism outlined by Rowe et al. (2016). In addition, it is unclear how parents' use of noun- and verb-eliciting wh-questions and prompts evolves as children grow, or how children respond to these queries. In order to understand how parental wh-questions and prompts are related to noun bias in children's early productive vocabulary, cross-linguistic data are needed from the languages in which a weaker noun bias has been observed.

As one attempt to address these gaps in the existing literature on parental wh-questions and prompts and on noun bias in children's early productive vocabulary, we conducted a cross-sectional study of French-speaking parents and children at 16, 20, and 30 months of age. In particular, this paper aims to answer the following research questions: (1) Do French-speaking parents provide prompts (e.g., answers) when children do not respond to wh-questions? (2) Do their patterns of noun- and verb-eliciting wh-questions change depending on the child's age? and (3) Do children produce more noun or verb responses to wh-question or prompts across age? We used the Event Description Task, specifically designed for the present study, in order to provide the same stimuli to different age groups and to give parents more equal opportunity to describe objects and dynamic actions using nouns and verbs.

## **2. Methods**

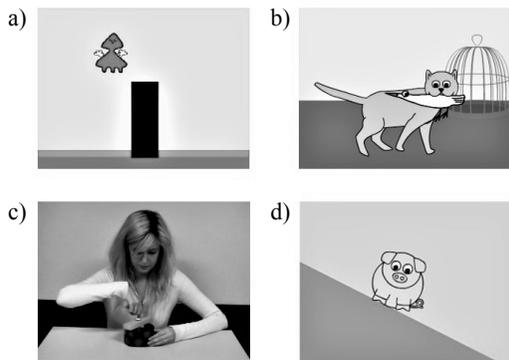
### **2.1. Participants**

Sixty French-speaking parents and their children from three different age groups participated in the study: 16-month-olds ( $M=16;17$ ,  $range=15;28-17;03$ ), 20-month-olds ( $M=20;20$ ,  $range=19;00-21;00$ ), and 30-month-olds ( $M=30;11$ ,  $range=30;00-31;08$ ). There were 10 boys and 10 girls in each age group. They all lived in Montreal. The dyads were recruited from a pool of parents who had expressed interest in participating in developmental studies with their children.

The children had no developmental/language disorders nor hearing problems and were exposed to French at least 70% of the time.

## 2.2. Data Collection

The Event Description task, consisting of a sequence of 13 silent video clips, was developed to investigate how parents describe dynamic events to their child. The clips depicted dynamic events in which an agent (person, animal, or imaginary character) performed an intransitive or a transitive action (see Figure 1). Each clip lasted about 7 seconds and was played three times in a row, for a total duration of 4.5 minutes for the whole sequence. The dyads saw one of two opposite presentation orders, in order to control for the order effect. Parents were instructed to verbally describe the clip to their child as they normally would. No instructions were given concerning how or when to describe the events. Although the sequence of clips itself implicitly suggests a timeframe, parents were free to discuss previous clips, speculate about coming clips, etc. The sessions were videotaped.



**Fig. 1. Still images of sample dynamic action events. a) animal jumping, b) cat biting a bird, c) girl turning a toy, d) pig rolling down**

The Event Description Task was designed and chosen for several reasons. First, we wanted both objects and actions to be equally salient in the scenes. Parental speech during picture-book tasks tends to contain more nouns than during toy-play sessions (Ogura, Dale, Yamashita, Murase, & Maheiu, 2006; Oshima-Takane, 2006; Tardif, Gelman, & Xu, 1999). We think this may be due to the static nature of the image, which may favor the objects over the actions performed. By using dynamic video clips, we were hoping to provide a more equal opportunity for the production of nouns and of verbs. Second, we believe that this task mimics a frequent scenario in child-caregiver interactions. Several activities of daily life, such as the joint observation of some animal moving (e.g., a dog running) or the joint watching of animations, may prompt parents to

describe dynamic events to their child and try to converse about them. Finally, using the same video clips allows us to perform direct comparisons of parental speech among different age groups.

### 2.3. Transcription and coding

All utterances produced by parents and children during the sessions were transcribed following CHAT format (MacWhinney, 2000). Parents' utterances describing the events were coded for noun- and verb-eliciting wh-questions (e.g., "*qu'est que c'est?*" [what's this?], "*qu'est ce-qu'il fait?*" [what's he doing?]) and prompts following their wh-questions (e.g., "*c'est une bibitte*" [it's a bug], "*il mange*" [he's eating], "*hein?*" [huh?]). Children's responses to each wh-question and prompt were coded as noun, verb, noun-and-verb, other verbal, non-verbal, or no response.

Four transcripts per age group were randomly selected for reliability coding. Mean percentage of agreement between the original coder and the reliability coder was 93.33% (*range* = 80-100%).

### 2.4. Measures and analyses

The frequency of parents' wh-questions and prompts were counted using the *FREQ* program (MacWhinney, 2000) and used as parents' input measures. In addition, their prompts were further classified into two primary types: parent-provided answers (e.g., "*c'est une bibitte*" [this is a bug]) and non-answers (e.g., "*hein?*" [huh?], "*tu peux le dire?*" [can you say it?]) to the wh-question.

Proportions of wh-questions and prompts that received a response from the child were calculated. The frequencies of children's noun and verb responses to parents' queries (wh-questions and prompts combined) were also counted and used as children's noun and verb response measures, respectively.

## 3. Results

### 3.1. Parental Wh-questions and prompts

Figure 2 shows the mean frequencies of parental wh-questions and prompts eliciting nouns or verbs, by age group. Independent-sample *t*-tests revealed a significant increase in noun-eliciting wh-questions with children's age from 16 to 30 months (16m vs. 20m:  $t(38)=2.31$ ,  $p=.03$ ; 20m vs. 30m:  $t(38)=3.17$ ,  $p=.003$ ). In contrast, verb-eliciting wh-questions increased only between 20 and 30 months ( $t(38)=2.69$ ,  $p=.01$ ). Paired samples *t*-tests showed that noun-eliciting wh-questions were more frequent than verb-eliciting wh-questions in the 20-month ( $t(19)=2.42$ ,  $p=.026$ ) and 30-month ( $t(19)=3.55$ ,  $p=.002$ ) groups. Parents of 16-month-olds showed no significant difference between them, indicating no bias.

Not all, but the vast majority of parents provided at least one prompt during the session: 80% in the 16-month group, 100% in the 20-month group, and 95%

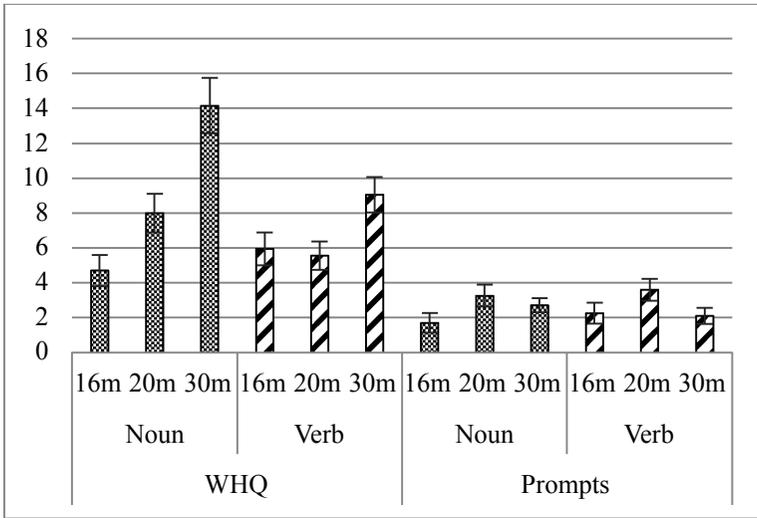
in the 30-month group. Table 1 presents the percentages of main prompt types, summed by age group. Of the prompts coded in the 16-month group, 87% were answers, compared to 77% and 75% in the 20- and 30-month groups, respectively. We further divided this type into two subtypes: (1) answer-only and (2) answer+agreement, in which the parent asked the child to agree with the label provided, typically by turning the answer into a question.

- (1) Answer-only  
 Mother: ah@i c'est quoi ça? [what's this?]  
 Mother: un crocodile . [a crocodile]
- (2) Answer+agreement  
 Mother: qu'est-c(e) qu'e(lle) fait la grenouille? [what's the frog doing?]  
 Mother: est-c(e) qu'e(lle) saute? [is she jumping?]

Non-answer prompts were also divided into subtypes: (3) verbal nudge (4) reminder to look, (5) non-wh question.

- (3) Verbal nudge  
 Mother: qu'est-c(e) qu(e) e(lle) fait la madame? [what's the lady doing?]  
 Mother: hmm@i? [hmm?]
- (4) Reminder to look at the screen  
 Mother: ça c'est quoi? [what's this?]  
 Mother: regarde. [look.]
- (5) Non-wh-question  
 Mother: qu'est-c(e) qu(e) il a dans la bouche? [what does he have in his mouth?]  
 Child: &tipita. (unclear fragment)  
 Mother: est-c(e) que t(u) as vu ? [did you see?]

Independent samples *t*-tests showed a significant increase only in the overall number of prompts between 16 and 20 months ( $t(38)=2.260, p=.03$ ), and there were no significant biases toward noun- or verb-eliciting in prompts.



**Fig. 2. Mean frequency of parents' wh-questions and prompts eliciting nouns or verbs. Error bars indicate standard errors.**

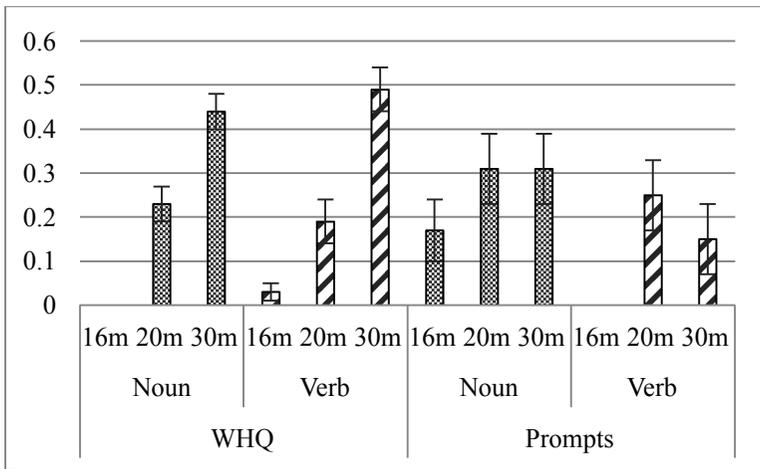
**Table 1. Distribution of main prompt types used by parents, per age group.**

		16m	20m	30m
Prompts containing the answer to the parent's WHQ	<i>Answer only</i>	79.8	61.1	53.5
	<i>Answer + request for agreement</i>	7.6	16.0	21.2
Verbal nudge		7.6	6.2	10.1
Non-wh question		1.3	2.1	3.0
Instruction ("look")		0.0	2.8	3.0

### 3.2. Children's responses

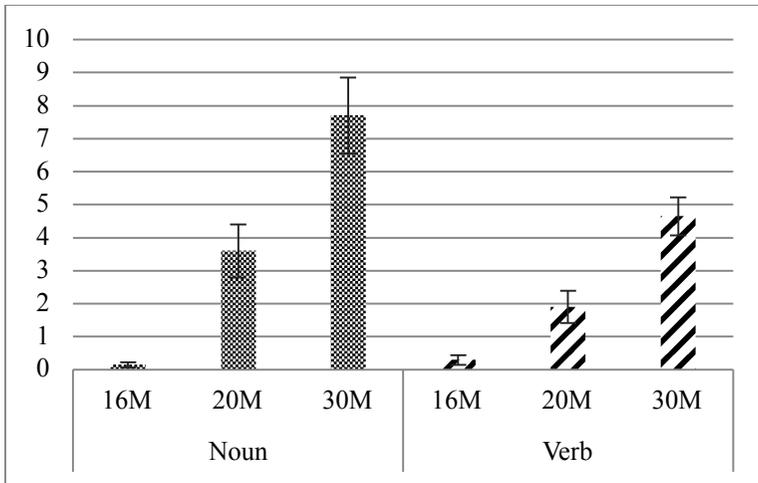
Figure 3 depicts the mean proportions of noun and verb-eliciting wh-questions and prompts that received any verbal response from the child. No 16-month-olds provided any verbal responses to noun-eliciting wh-questions, and only three of them gave one or two responses to verb-eliciting wh-questions. However, all but one verb responses were onomatopoeias. Independent samples *t*-tests showed that children's verbal responses to wh-questions increased with age (noun-eliciting WHQ: 16M vs. 20M  $t(19)=5.94$ ,  $p<.001$ ; 20M vs. 30M  $t(38)=3.61$ ,  $p=.001$ ; verb-eliciting WHQ: 16M vs. 20M  $t(22)=2.83$ ,  $p=.01$ ; 20M vs. 30M  $t(37)=4.03$ ,  $p<.001$ ). Paired samples *t*-tests indicated that 20- and 30-

month-olds showed no significant differences in the proportion of verbal responses to noun-eliciting vs. verb-eliciting wh-questions.



**Fig. 3. Mean proportions of noun- and verb-eliciting wh-questions and prompts that received a verbal response. Error bars indicate standard errors.**

Figure 4 presents the mean frequencies of noun and verb responses to parental queries (wh-questions and prompts combined), regardless of the word class queried. Both types of responses became more frequent with children's age from 16 to 30 months (nouns: 16m vs. 20m:  $t(19)=-4.24, p<.001$ ; 20m vs. 30m:  $t(38)=-2.92, p=.006$ ; verbs: 16m vs. 20m:  $t(22)=-3.15, p=.005$ ; 20m vs. 30m:  $t(38)=-3.65, p=.001$ ). Only seven 16-month-olds gave either noun or verb responses: three of them provided only noun responses and the remaining four only verb responses. However, paired samples  $t$ -tests showed that noun responses outnumbered verb responses at 20 months ( $t(19)=2.29, p=.034$ ) and 30 months ( $t(29)=2.61, p=.017$ ). This developmental pattern runs parallel to trends in parental input, with noun-eliciting wh-questions dominating over verb-eliciting ones in the two older age groups and no bias in the youngest age group.



**Fig. 4. Mean frequencies of noun and verb responses to wh-questions and prompts regardless of targeted word class. Error bars indicate standard errors.**

#### 4. Discussion

The French-speaking parents in this study asked children wh-questions eliciting nouns and verbs, referring to the objects and actions in the silent videos they were watching together. They did so even with 16-month-old children, who gave few verbal responses. Furthermore, when children didn't give a response or only an unclear one, parents provided post-question prompts, mainly in the form of answers to their own question. The number of parental wh-questions increased significantly with age group, with an asynchrony between noun- and verb-eliciting wh-questions: Whereas the increase in noun-eliciting wh-questions began between 16 and 20 months, the number of verb-eliciting wh-questions grew significantly only between 20 and 30 months. Unlike English-speaking parents in other studies (Clark & Wong, 2002; Goldfield, 1993), French-speaking parents used noun-eliciting wh-questions more frequently than verb-eliciting questions only with children 20 months of age and older; there was no bias when children were 16 months of age. Children's responses paralleled these changes in input, as we found that noun responses outnumbered verb responses at 20 months and even more so at 30 months.

An important finding in the present study was that neither a noun nor a verb bias was detected in either parents' queries or in children's responses in the 16-month group. At this age, only a few children produced any utterances and even fewer responded to wh-questions or prompts. Moreover, five out of the six verb responses in the 16-month group were onomatopoeias and one of the two noun responses was an actual common noun. However, parental feedback to these answers was positive, as shown below.

- (6) Onomatopoeia in place of a verb  
 Mother: qu'est-c(e) qu'i(l) fait le poisson? [what is the fish doing?]  
 Child: boopboopboop@o .  
 Mother: ouais: &=laughs ! [yeah]
- (7) Onomatopoeia in place of a verb  
 Mother: ah@i c'est un chien qui mange! [it's a dog that's eating!]  
 Mother: quand qu'i(ls) mangent pas les chiens qu'est-c(e)-qu'i(ls) font?  
 [when they're not eating, what do dogs do?]  
 Child: woufwouf@o!  
 Mother: woufwouf@o!  
 Mother: C'est ca! [that's right!]  
 Mother: t(u) es bonne! [you're good]  
 Mother: bravo bravo!
- (8) Onomatopoeia in place of a noun  
 Mother: qu'est-c(e) que tu vois? [what do you see?]  
 Child: ah@i!  
 Mother: c'est un chien qui mange! [it's a dog that's eating!]  
 Mother: un chien. ('a dog')  
 Mother: ouais j(e) pense c'est un <chien>[>]. [yeah, I think it's a dog.]  
 Child: <woufwouf@o>[<].  
 Mother: ouais woufwouf@o un p(e)tit chien tout poilu (.) et frisé qui  
 mange. [yeah, woof-woof a little furry and curly dog that's eating.]

It is worth noting that, in several cases, the child's onomatopoeia response is not off-target per se; it just does not refer to the specific events in the clip. The child may refer to a typical attribute or behavior of the target object (e.g., barking, shrieking, or blowing bubbles). Moreover, in French, questions such as "what is the dog doing?" (specific) and "what does the dog do?" (generic) can be confounded. It is also highly plausible that the purpose of parents' queries differs depending on the child's age or perceived verbal ability so that, at a younger age, the goal is to encourage and reinforce conversational exchange, rather than getting the child to learn specific words or produce accurate responses. Therefore, the parent may deem the onomatopoeia an adequate answer to their wh-question.

As has been observed in other populations (e.g., Clark & Wong, 2002, Ninio et al., 1980), the French-speaking parents in the present study followed wh-questions with prompts, encouraging their child to respond or providing feedback on the child's answer. The most common type of prompt was the parent supplying their own answer to the question, either alone or in conjunction with a query for the child's agreement. The other typical types of prompts in the present data were verbal nudges, reminders to look at the video clip, and non-wh questions. Overall, the use of prompts by the parents in this study supports the

mechanism outlined by Rowe and her colleagues (2016), but the different types of prompts we observed might further point to varying intentions behind this parental behavior. For instance, supplying a label prioritizes the word offer, repeating the child's response reinforces it, and verbal nudges communicate that it is desirable and important that the child replies. The prompting style used may depend on several factors, such as the adult's beliefs about the child's abilities. This interpretation is supported by DeLoache and DeMendoza (1987). In their cross-sectional study of parental behaviors during picture-book reading with 12-, 15- and 18-month-olds, DeLoache and Demendoza argued that the "mother appears to have the goal of eliciting the highest possible level of behaviour from her child" (p.121). More passive behavior is accepted from younger children, while more active behavior demanded from the older, more capable group. This can be observed in the following example with a 20-month-old: the parent first repeats the child's onomatopoeia (as in examples (7) and (8) above, featuring 16-month-olds) but then also challenges the child to complete her sentence and produce the correct word.

- (9) 20-month-old  
 Mother: ça c'est quoi? [this, what is it?]  
 Child: ouhaha@o  
 Mother: ououhaha@o  
 Mother: c'est le+... [it's the...]  
 Child: ouhaha@o!  
 Mother: c'est le singe. [it's the monkey.]  
 Child: le tinge [:singe]. [the monkey.]

In the same vein, parents did not appear to favor any particular word class in their wh-questions with 16-month-olds as they did with more responsive children. By 20 months, children are much more able to respond verbally and, from this point on, we observe that parents are more likely to target nouns than verbs in their wh-questions and a corresponding noun bias in children's overall responses to parental queries. These results offer a possible explanation for the noun and verb production patterns in French-speaking children observed by Bassano et al. (2005). In their data, common noun types dominate over action verb types from 20 months (the youngest group in their study) to 39 months, as noun-eliciting wh-questions do in the present data at 20 and 30 months. However, they also report a significant increase between 20 and 30 months in the proportions of types and tokens occupied by verbs. This echoes the increase in verb-eliciting wh-questions between 20 and 30 months in the present study, suggesting that wh-questions may play a significant role in shaping the composition of children's vocabulary. Based on these parallels, we would tend to agree with Goldfield's (2000) argument that the noun bias observed in children's early vocabulary may be promoted by parents requesting noun production more than verb production.

It follows that parental wh-questions may also account for the differences in the degree of noun bias in children's early productive vocabulary among different linguistic and cultural populations. Literature on this issue indicates that English-speaking children tend to have a stronger noun bias than children from some other language groups, including French (Bassano, 2000; Bassano et al., 1998; Oshima-Takane, 2006). Likewise, English-speaking parents show a noun bias in their queries earlier and more consistently across age groups (e.g., Goldfield, 1993, 2000; Clark & Wong, 2002). In Clark & Wong's (2002) study, parents offered nouns through wh-questions more often than verbs with all age groups, ranging from one- to five-year-olds, and the mothers in Goldfield (1993) requested the production of nouns more often than verbs from their 12-month-olds. In comparison, we found such a bias only in the 20- and 30-month groups. The lack of a noun bias in parental wh-questions to 16-month-olds seems to provide some evidence of the mechanisms through which children show a noun bias in early productive vocabulary. That is, when English-speaking parents favor the production of nouns over verbs in their wh-questions, consistently and from early on, the children are encouraged to produce more nouns than verbs and are likely to show a stronger noun bias. In contrast, when the frequency of parental noun-eliciting wh-questions exceeds that of verb-eliciting wh-questions only from a later age, as observed in in the present study, children are likely to show a weaker noun bias in their early productive vocabulary.

In order to provide more convincing evidence for a link between parental wh-questions and prompts and children's noun bias, however, further research is needed not only to investigate parental wh-questions and prompts and children's responses but also to analyze parents' and children's overall use of nouns and verbs. It is also important to study languages other than French in which a weaker noun bias is observed. Furthermore, longitudinal or experimental designs could allow us to examine whether there is a correlational or causal relationship between parental wh-questions and any noun-verb asynchronies in children's early productive vocabulary.

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