Acquisition of early words from single-word and sentential contexts

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Abstract

Toddlers 15 and 18 months of age were exposed to audiovisual recordings of two novel words paired with novel toys. The words were presented in familiar sentence frames or in isolation. Linguistic context had a greater effect on younger than on older infants. Specifically, 15-month-old boys exhibited successful learning only in the context of single words, and 15-month-old girls did so only for words presented in sentences. Older infants acquired the new words from both contexts, and they learned more rapidly than younger infants. Receptive and expressive vocabulary made no independent contribution to performance.

Introduction

The second year of life typically begins with a one- or two-word productive vocabulary and ends with a vocabulary of hundreds of words (Fenson, Dale, Reznick, Bates, Thal & Pethick, 1994). Although there has been considerable progress in identifying the factors that influence early word learning, much remains unclear. We know, for example, that increasing social and cognitive abilities allow toddlers to capitalize on relevant aspects of the input (e.g. P. Bloom, 2000; Hirsh-Pasek, Golinkoff & Hollich, 2000; Waxman & Booth, 2003), but we know little about properties of the input that are critical at very early stages of word learning.

Longitudinal investigations of mother–infant interaction have revealed some of the factors that contribute to word learning. For example, Brent and Siskind’s (2001) analysis of spontaneous maternal speech to 9- to 15-month-old infants indicated that the frequency of words heard in isolation predicts infants’ subsequent use of those words (see also Ninio, 1993). The conclusion that exposure to isolated words, however limited (see also Aslin, Woodward, LaMendola & Bever, 1996; Fernald & Morikawa, 1993), promotes early lexical acquisition must be tempered by the fact that the words used in isolation were used, at other times, in sentential contexts. The presentation of single words, along with the placement of focused words in sentence-final position, undoubtedly increases the acoustical salience of those words (Fernald, 2000).

The quantity of maternal speech to toddlers 14–26 months of age is related to their rate of vocabulary growth (Huttenlocher, Haight, Bryk, Seltzer & Lyons, 1991). Maternal speech quality is also relevant, as indicated by relations between its lexical and syntactic richness and toddlers’ vocabulary size (Hoff & Naigles, 2002). Although parents’ ostensive naming practices do not predict vocabulary size in 16- to 20-month-olds, such practices predict toddlers’ ability to learn new word–object pairs (Tan & Schafer, 2005). Despite significant strides in identifying the effects of linguistic input on early language acquisition, much remains unknown. For example, it is unclear whether single words are as effective as sentential contexts in promoting early receptive word learning. Questions such as these require controlled comparisons in the laboratory rather than inferences from everyday exposure.

Laboratory investigations of the acquisition of word–object associations have used single words (Schafer & Plunkett, 1998; Werker, Cohen, Lloyd, Casasola & Stager, 1998), sentential frames (e.g. Baldwin, 1993; Tomasello & Barton, 1994; Woodward, Markman & Fitzsimmons, 1994), or some combination of the two (Ballem & Plunkett, 2005; Tan & Schafer, 2005). Nevertheless, there have been no direct comparisons of these different learning contexts. In the present investigation, we sought to ascertain the relative efficacy of single-word and sentential contexts in early word learning.

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In principle, sentential frames could facilitate word acquisition by various means. Word-final position and emphatic stress highlight the target word (Fernald & Mazzie, 1991). Familiar sentence frames such as ‘Look at the X’ reveal the speaker’s act as one of naming (Akhtar & Tomasello, 2000) and indicate X as an object. Positive vocal affect, if present, should promote infant attention (Singh, Morgan & Best, 2002) and learning (Thiessen, Hill & Saffran, 2005). In a number of studies, toddlers have acquired new words by watching and listening to an experimenter talk about objects in the immediate environment (e.g. Baldwin, 1993; Namy & Waxman, 2000; Tomasello & Barton, 1994; Woodward et al., 1994). For example, Woodward et al. (1994) familiarized 13- and 18-month-old infants with two objects, one of which was named nine times in the context of infant-directed sentences. Younger and older toddlers learned the named word, but younger toddlers’ performance was prone to disruption by minor changes in the test procedure. Namy and Waxman (2000) argued for the facilitative influence of sentential contexts on the basis of their finding that 17-month-olds mapped new words onto object categories for words embedded in typical infant-directed utterances but not for those preceded by a single-word carrier phrase (e.g. ‘Look’). In other research, however, 18-month-olds successfully linked new words with familiar visual images when the target words were preceded by a single-word carrier phrase (Houston-Price, Plunkett & Harris, 2005). Multiple differences across these studies preclude simple interpretations of the discrepant findings.

Single-word presentation could assist young toddlers by reducing the ambiguity of word-referent mappings and the need for segmenting the auditory input. Studies involving audiovisual pairings of isolated words and single objects (Schafer & Plunkett, 1998; Werker et al., 1998) have demonstrated toddlers’ acquisition of word–object associations. Werker et al. (1998) habituated 14-month-olds to word–object pairings, after which they received one word–object pair that matched the original pair and another that mismatched (e.g. the label that previously accompanied object A now accompanied object B). Infants increased their attention on mismatching trials (i.e. novel word–object combinations) but not on matching trials, revealing their acquisition of word–object associations. Schafer and Plunkett (1998) tested 12- to 17-month-olds with a variant of the familiarization/preferential-looking procedure (Golinkoff, Hirsh-Pasek, Cauley & Gordon, 1987). These toddlers received 12 audiovisual pairings of each of two novel objects and labels, after which they were tested with repetitions of each word while both objects were in view. Infants looked significantly longer at the labeled object, revealing their association of auditory and visual events.

What toddlers learn in procedures like those of Werker et al. (1998) and Schafer and Plunkett (1998) is likely to differ from what they learn in conventional word-learning contexts. As noted, these investigators presented images of objects paired with single-syllable words. This situation contrasts with the live interaction, real objects, and sentential contexts used by Woodward et al. (1994). Moreover, the words were presented in the identical manner at training and test, in contrast to their embedding in different utterances at training and test in Woodward et al. (1994). It remains unclear whether toddlers trained with the Werker et al. (1998) or Schafer and Plunkett (1998) procedure would exhibit learning if the test stimuli differed in some respects from the training stimuli. For adults as well as infants, memory for auditory and visual stimuli is best when the retrieval context matches the encoding context (Houston & Jusczyk, 2003; Singh, Morgan & White, 2004; Tulving & Thompson, 1973).

Although the evidence indicates that toddlers can acquire word–object associations from sentential contexts or from single-word contexts, it is unclear whether these contexts lead to comparable learning at different stages of language acquisition. Toddlers of different ages are likely to capitalize on different aspects of the word-learning situation (Hollich, Hirsh-Pasek & Golinkoff, 2000). For example, younger learners rely on different cues than do older learners, who exhibit greater cognitive flexibility and accord greater weight to social cues. The presumption is that immature word learners are guided largely by perceptual salience, which overshadows other cues. For example, 12-month-olds attach labels to objects that interest them rather than the speaker (Hirsh-Pasek et al., 2000). Moreover, 13-month-olds, but not 20-month-olds, acquire links between non-speech sounds and objects as readily as those between words and objects (Woodward & Hoyn, 1999). By 18 or 19 months of age, however, the speaker’s referential behavior seems to become increasingly important for word–object mapping (Akhtar & Tomasello, 2000; Hirsh-Pasek et al., 2000; Moore, Angiulfos & Bennett, 1999). Although 18-month-olds give priority to non-verbal referential cues (i.e. the speaker’s gaze direction) over object salience cues (i.e. object movement), they differ from 24-month-olds in failing to associate words with objects when these cues conflict (Moore et al., 1999). To date, however, discussions of salience in word-learning contexts have focused largely on visual as opposed to acoustical salience. In the present study, we sought to ascertain the relative efficacy of single-word and sentential contexts at different age levels.
Characteristics of the learner other than age may play a role in word learning. What is learned and how it is learned may depend not only on the quality and quantity of input but also on the learner’s interests, experience, and language ability (L. Bloom, Margulis, Tinker & Fujita, 1996; L. Bloom & Tinker, 2001; Tsao, Liu & Kuhl, 2004). For example, greater social interests on the part of infant girls (e.g. Gunnar & Donahue, 1980; Lutchmaya & Baron-Cohen, 2002; McClure, 2000) may promote differences in parents’ linguistic input (Brody, 1999; Stern & Karraker, 1989), which could have implications for toddlers’ lexical development (Bauer, Goldfield & Reznick, 2002; Fenson et al., 1994; Huttenlocher et al., 1991; Reznick & Goldfield, 1992).

In the present study, we examined word learning in sentential and single-word contexts by toddlers 15 and 18 months of age. We predicted that linguistic context (sentence or single word) would have differential consequences for younger and older toddlers. Specifically, we expected younger toddlers to learn less efficiently and less flexibly than older toddlers, who were expected to derive greater benefit from the available cues in sentential contexts.

We used a variant of the intermodal preferential-looking procedure (Golinkoff et al., 1987; Schafer & Plunkett, 1998) to assess toddlers’ acquisition of new words. In the training phase, toddlers heard recordings of two novel object labels on successive trials, either in isolation (i.e. citation form) or in sentential frames, accompanied by video displays of each of two novel toys. In the test phase, stationary images of the two objects appeared simultaneously, along with a recorded request to find the named object. Although the procedure was similar to that of Schafer and Plunkett (1998) in some respects, it differed in the use of sentential as well as single-word contexts, infant-directed prosody, and variations in visual and auditory stimuli between training and test trials.

Method

Participants

The participants were 124 healthy toddlers who were approximately 15 and 18 months of age: 31 boys and 31 girls 14.4–15.6 months of age (M = 15.0 months) and 31 boys and 31 girls 17.4–18.7 months of age (M = 17.8 months). Additional infants were excluded from the final sample because of fussing during the test session (younger group: 1 boy, 2 girls; older group: 3 boys, 4 girls) or experimenter error (younger group: 2 girls; older group: 2 girls).

Stimuli

The stimuli consisted of audiovisual recordings of two novel objects (Figure 1), each of which was accompanied by one of two novel words, bandy and noggy. Speech stimuli were produced by a native speaker of English in an infant-directed style. The training stimuli were presented three times within the following sentence frames – Look at the X, This is a nice X, I like the X – or three times in isolation. In the latter condition, the spacing of single words matched the spacing of target words in sentential presentation. The words bandy and noggy were selected as target words because of their phonetic contrastiveness and typical diminutive form. The test stimuli, which were identical for sentence and single-word conditions, consisted of the following sentences: Where is the X? Do you see the X? Find the X. Each test trial included all three sentences.

The target objects were animal-like cloth toys that were similar in size but differed in shape, color, and surface pattern. In recordings for the training phase, each toy was dangled from clear wire, which created the illusion that it was jumping up and down. In the test phase, stationary images of both objects appeared simultaneously, one on each monitor, while the test sentences were broadcast.

The audiovisual stimuli for the training trials were recorded with a Sony DCR-TRV315 digital video recorder and edited with FinalCutPro, each sequence being 11.08 s in duration. Visual stimuli for the test trials were created by capturing stationary images of each test object from the video and setting them in a uniform green background. Audio test stimuli were digitally

Apparatus

Test sessions were conducted in a quiet, dimly lit enclosure (1.83 m × 2.60 m) within a larger room. Stimulus presentation and response recording were controlled by custom software for a Macintosh G4 computer. Infants sat on their parent’s lap facing two 18-in monitors (Sony Multiscan E400) placed side-by-side, 35 cm apart, each about 1 m from the infant. A centrally located red light was in view and a centrally located loudspeaker (Altec Lansing ACS22) was out of view. An observer hidden behind a partition facing the infant wore headphones (KOSS TD/60) delivering instrumental music to obscure the auditory stimuli presented to infants. A hidden digital camera (Sony DCR-TRV315) recorded infant behavior throughout the test session. The observer viewed the infant through a hole in the front panel of the enclosure, recording each instance of looking toward and away from each monitor on a key pad connected to the computer.
recorded (Sony TCD-D7) and edited (SoundEdit 16) to yield files that were 6.1 s in duration. A 3-s silent period preceded each audiovisual test file, yielding sequences of 9.1 s. The assignment of words to objects was counterbalanced across infants. Custom-designed software controlled the sequencing of training and test episodes, side of presentation, and assignment of words to objects. During the training phase, the number of times an infant looked away from the target monitor was tabulated. During the test phase, looking time at target and non-target objects was tabulated for each test trial, as were total looking time and looking time at target and non-target objects as a proportion of overall looking time at both monitors.

Procedure

Infants were seated on their parent’s lap facing the monitors. Parents kept their eyes closed during the entire test session to preclude prompting of infant responses. (Pilot testing revealed that mothers’ use of headphones was highly distracting to toddlers.) Infants viewed four training videos, two for each object, which alternated from trial to trial so that each object always appeared on the same monitor. Word–object pairing and toy-monitor assignment created four possible sets, which were assigned randomly.

The training phase began with the screen on one monitor flashing to attract infants’ attention. When the infant looked at the flashing screen, the first training video began. The hidden observer, who was unaware of the infant’s assignment to word–object pairs and could not hear or see the test stimuli, recorded infant looking behavior throughout the session. She pressed designated keys when the infant looked toward and away from each monitor. When looking away from the monitor exceeded 2 s, the video stopped automatically, and a flashing screen re-engaged infant attention. The video continued from the beginning of the segment in which the interruption occurred for single-word as well as sentential conditions, yielding identical exposure times to the videos in both conditions. Training continued, with the infant attending to each word–object pair on a different monitor until six pairings of each word and object had occurred. Following the training phase, a red light between the monitors flashed, and the test phase began as soon as the infant focused on the light. Each test trial began with a 3-s silent period during which both objects appeared on the monitors. Trials with all three test sentences followed, with both objects remaining in view. There were four test trials, two for each word. The order of trials was determined randomly, yielding six possible sequences. After completing the test phase, training and test phases were repeated. Thus, each infant received a total of 12 repetitions of each word–object pair and four test trials with each word across the two blocks of training and test trials.

The experimenter, who was hidden behind a panel facing the infant, observed the infant continuously, initiated trials, and recorded each instance of looking toward and looking away.
away from each monitor by pressing a designated key. Pilot testing with a second scorer revealed greater accuracy of on-line recording of infant looking behavior from behind the screen in the darkened room than from on- or off-line images of the infant’s face. Accordingly, on-line recording of responses was used in conjunction with controls to preclude observer bias (i.e. no knowledge of test condition, inability to perceive the auditory or visual stimuli). All sessions were videotaped in night-shot mode to confirm that parents kept their eyes shut throughout the test session and to corroborate the observer’s judgments of infant fussing.

Within one week of testing, parents completed the MacArthur Communicative Development Inventory (CDI): Words and Gestures. Vocabulary scores were derived as follows: (1) Receptive vocabulary was tabulated from the number of items understood in ‘Vocabulary Checklist’ (Section D); (2) Productive vocabulary was tabulated from the number of these items understood and produced.

### Table 1
Mean looking times (and standard deviations) in seconds for target and non-target images during silent pre-test phase and test phase in sentential condition

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Target</th>
<th>Non-target</th>
<th>Looking at target/Total looking time</th>
<th>Test</th>
<th>Target</th>
<th>Non-target</th>
<th>Looking at target/Total looking time</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 months boys</td>
<td>15</td>
<td>7.72 (1.19)</td>
<td>7.02 (1.52)</td>
<td>.53 (0.9)</td>
<td>23.21 (5.85)</td>
<td>21.61 (4.48)</td>
<td>.52 (0.9)</td>
<td></td>
</tr>
<tr>
<td>girls</td>
<td>15</td>
<td>6.87 (1.60)</td>
<td>6.66 (1.59)</td>
<td>.51 (0.9)</td>
<td>22.83 (4.08)</td>
<td>19.13 (4.24)</td>
<td>.55 (0.9)</td>
<td></td>
</tr>
<tr>
<td>18 months boys</td>
<td>15</td>
<td>6.83 (1.97)</td>
<td>7.39 (2.39)</td>
<td>.49 (1.2)</td>
<td>26.05 (7.57)</td>
<td>18.56 (5.98)</td>
<td>.58 (1.0)</td>
<td></td>
</tr>
<tr>
<td>girls</td>
<td>15</td>
<td>7.69 (1.63)</td>
<td>7.17 (1.53)</td>
<td>.52 (1.0)</td>
<td>27.70 (3.5)</td>
<td>21.03 (3.5)</td>
<td>.57 (0.8)</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2
Mean looking times (and standard deviations) in seconds for target and non-target images during silent pre-test and test phase in single-word condition

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Target</th>
<th>Non-target</th>
<th>Looking at target/Total looking time</th>
<th>Test</th>
<th>Target</th>
<th>Non-target</th>
<th>Looking at target/Total looking time</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 months boys</td>
<td>16</td>
<td>6.39 (1.76)</td>
<td>8.05 (2.02)</td>
<td>.44 (.11)</td>
<td>21.53 (5.46)</td>
<td>17.48 (4.03)</td>
<td>.55 (0.9)</td>
<td></td>
</tr>
<tr>
<td>girls</td>
<td>16</td>
<td>6.83 (1.32)</td>
<td>7.15 (1.5)</td>
<td>.49 (.05)</td>
<td>23.05 (4.58)</td>
<td>23.23 (4.49)</td>
<td>.50 (0.7)</td>
<td></td>
</tr>
<tr>
<td>18 months boys</td>
<td>16</td>
<td>6.46 (1.67)</td>
<td>6.98 (1.57)</td>
<td>.48 (.10)</td>
<td>21.98 (4.5)</td>
<td>19.03 (3.88)</td>
<td>.54 (0.5)</td>
<td></td>
</tr>
<tr>
<td>girls</td>
<td>16</td>
<td>6.35 (2.23)</td>
<td>6.61 (2.68)</td>
<td>.50 (.12)</td>
<td>21.16 (5.4)</td>
<td>17.4 (.5)</td>
<td>.56 (0.8)</td>
<td></td>
</tr>
</tbody>
</table>

### Results

Maximum possible looking time toward both monitors across the two trial blocks was 24 s for the silent pre-test phase and 48.8 s for the test phase. Looking times at target and non-target images in sentential and single-word conditions as well as looking time at the target as a proportion of total looking time are shown in Tables 1 and 2. Preliminary analyses of variance (ANOVA), with word–toy pairing, toy-monitor assignment, and starting side in training as independent variables and proportion of looking at the target as the dependent measure revealed no effects. Accordingly, these factors were excluded from further consideration. Looking at the target image during the silent pre-test phase did not exceed chance levels (.5) for girls, t(61) = .79, ns, or for boys, t(61) = .6, ns, which ruled out toy biases.

Proportion of looking at the target image during test trials (see Figure 2) was the dependent variable in a four-
way mixed-design ANOVA, with Condition (sentences, single words), Age (15 months, 18 months), and Sex (boys, girls) as between-subjects factors, and Trial Block (first, second) as a within-subjects factor. There was a significant main effect of Age, $F(1, 120) = 6.63, p < .01$, with older infants looking proportionately longer at the target object ($M = .56, SD = .79$) than younger infants ($M = .53, SD = .77$). In addition, there was a significant three-way interaction of Condition, Age, and Sex, $F(1, 116) = 4.36, p < .05$, and a marginally significant interaction between Trial Block and Age, $F(1, 116) = 3.19, p < .08$.

To clarify the three-way interaction, separate two-way ANOVAs, with Condition and Sex as between-subjects factors, were conducted for each age group. These revealed a significant interaction of Condition and Sex for 15-month-olds, $F(1, 56) = 4.43, p < .05$, but not for 18-month-olds. In the case of 18-month-olds, proportion of looking at the target image exceeded chance levels in both conditions for boys [sentential condition, $t(14) = 3.31, p < .005$; single-word condition $t(15) = 2.67, p < .05$] and for girls [sentential condition, $t(14) = 3.60, p < .005$; single-word condition, $t(15) = 2.89, p < .01$]. For 15-month-olds, however, girls’ performance exceeded chance levels in the sentential condition (.55), $t(14) = 3.41, p < .005$, but not in the single-word condition (.50), and boys’ performance exceeded chance levels in the single-word condition (.55), $t(15) = 2.17, p < .05$, but not in the sentential condition (.52), $t(14) = .68, ns$. The marginally significant interaction between Trial Block and Age arose from 15-month-olds’ increased proportion of looking at the target in the second trial block ($M = .55, SD = .11$) relative to the first ($M = .50 SD = .10$), $t(61) = 2.60, p < .01$, but no such difference for 18-month-olds, $t(61) = .34, ns$. In essence, younger infants required more exposures than older infants to learn the word–object pairs.

Receptive and productive vocabulary scores from 56 completed CDIs are shown in Table 3. Aside from the expected vocabulary advantages of 18-month-olds, the only significant difference involved 18-month-old girls’ larger receptive vocabulary than that of same-age boys. To assess the possibility that vocabulary was the principal factor underlying the observed effects, the data were re-analyzed with vocabulary scores as covariates. An analysis of covariance (ANCOVA), with Condition (2), Age (2), and Sex (2) as independent variables, proportion of looking time at the target (across trial blocks) as the dependent variable, and receptive vocabulary as the covariate, revealed a significant interaction among Condition, Age, and Sex, $F(1, 99) = 5.56, p < .05$, as in the original ANOVA. A similar ANCOVA with productive vocabulary as the covariate also revealed a three-way interaction, $F(1, 99) = 4.38, p < .05$. In short, the original age and gender effects persisted when vocabulary was held constant.

Table 3  Mean vocabulary scores (and standard deviations) by age and sex

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Receptive vocabulary</th>
<th>Productive vocabulary</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 months&lt;br&gt;boys</td>
<td>27</td>
<td>144.41 (77.19)</td>
<td>23.52 (24.57)</td>
</tr>
<tr>
<td>girls</td>
<td>29</td>
<td>116.45 (73.65)</td>
<td>17.83 (29.97)</td>
</tr>
<tr>
<td>18 months&lt;br&gt;boys</td>
<td>28</td>
<td>205.61 (87.87)*</td>
<td>54.16 (60.31)</td>
</tr>
<tr>
<td>girls</td>
<td>28</td>
<td>260.24 (80.95)*</td>
<td>94.32 (97.76)</td>
</tr>
</tbody>
</table>

* indicates significant differences between boys and girls, $p < .05$. 

Figure 2  Proportion of looking at target object (and standard errors) across trial blocks. One asterisk indicates $p < .05$, two asterisks for $p < .01$. 

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Discussion

The purpose of the present study was to evaluate the relative efficacy of single-word and sentential contexts for toddlers’ acquisition of new object names. To this end, 15- and 18-month-olds were exposed to audiovisual recordings of two novel toys paired with novel words presented singly or in sentential frames. Word recognition was assessed by means of a preferential-looking procedure. The 18-month-olds succeeded in acquiring new word–object pairs in sentential as well as single-word contexts, and they learned more rapidly than the 15-month-olds. The pattern of performance exhibited by 15-month-olds was perplexing in some respects. Training with single words facilitated learning for boys but not for girls, whereas training with sentential contexts had favorable consequences for 15-month-old girls but not for boys.

Consider, first, the age-related differences in learning. In contrast to 18-month-olds, who showed successful acquisition after only six word–object exposures, 15-month-olds showed comparable evidence of acquisition after 12 exposures. Older toddlers’ greater linguistic and cognitive abilities undoubtedly underlie their increased efficiency in word learning. Houston-Price et al. (2005) demonstrated that 18-month-olds could associate words with images after only three exposures to each of two word–image pairs. In contrast to the present study, which featured novel labels and images, Houston-Price et al. (2005) minimized the cognitive demands by requiring toddlers to attach novel labels to familiar and highly salient images (from Teletubbies), using two-syllable auditory stimuli that contrasted in all phonemes (shoofy vs. gapper), and using identical auditory and visual stimuli in training and test trials.

In the present study, older toddlers also demonstrated greater flexibility than younger toddlers in the use of available cues. In contrast to 15-month-old boys and girls, who learned in one training context but not the other, 18-month-olds learned in both contexts. A number of investigators have drawn attention to increases in the flexible use of word-learning cues and decreases in the influence of object salience in the second year of life (Hirsh-Pasek et al., 2000; Hollich et al., 2000; Moore et al., 1999). For example, Werker et al. (1998) found that 14-month-olds could associate novel labels and images only when the images were moving, but Houston-Price et al. (2005) found that 18-month-olds could link novel labels with familiar images that were stationary or moving.

In discussions of perceptual salience, the focus is typically on the intended referent (e.g. movement) as opposed to the linguistic input. Our presumption, in focusing on the input, was that the presentation of words in citation form would increase their salience and facilitate learning for 15-month-olds. This view was not borne out, however. Instead, 15-month-old boys profited from training with single words, and 15-month-old girls profited from training with words embedded in sentences. Regardless of the training context – single words or sentences – all toddlers were tested with sentences, albeit novel ones, which necessitated greater transfer of training in the single-word than in the sentential context. This potential advantage was not realized, however, because there were no overall differences in performance between sentential and single-word contexts at either age level.

In light of previous studies of word learning, which have revealed no gender differences (L. Bloom, 1993; Houston-Price et al., 2005; Tan & Schafer, 2005) or differences favoring girls (Werker et al., 1998; Woodward et al., 1994), the present difference is difficult to interpret. It could stem from experiential differences involving parents’ ostensive naming practices (Tan & Schafer, 2005) or their use of single words (Brent & Siskind, 2000). Parents’ style of verbal interaction may influence and be influenced by toddlers’ interests (Brody, 1999; L. Bloom, 1993; Stern & Karraker, 1989), which may map onto gender in some cases but not in others. It is worth noting, however, that instances of gender differences have been reported more frequently for young word learners (e.g. Werker et al., 1998; Woodward et al., 1994) than for older word learners.

In summary, the present investigation revealed unexpected consequences of linguistic form on novice word learners. At the earliest stages of lexical acquisition, toddlers were relatively inflexible in their reliance on specific linguistic contexts – single words in the case of boys and sentences in the case of girls. A few months later, they seemed to adapt their learning strategies to available cues in the input. Our findings add an interesting dimension to the debate on lexical acquisition, specifically, the need to focus on properties of the input and on propensities that toddlers bring to the word-learning situation (L. Bloom & Tinker, 2001; Pine, 1994). It is important to ascertain whether the gender differences that we identified in 15-month-olds reflect incidental differences in early learning strategies or stable differences that are evident in other contexts. In principle, boys and girls could follow somewhat different trajectories of word learning, just as ‘referential’ and ‘expressive’ children follow different paths to a common goal (Nelson, 1973). Finally, the present study adds to the growing body of evidence that toddlers can acquire new words without the rich social and communicative context of everyday life.
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