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BRIEF REPORT

Repetition Across Successive Sentences Facilitates Young Children's Word Learning

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Young children who hear more child-directed speech (CDS) tend to have larger vocabularies later in childhood, but the specific characteristics of CDS underlying this link are currently underspecified. The present study sought to elucidate how the structure of language input boosts learning by investigating whether repetition of object labels in successive sentences—a common feature of natural CDS—promotes young children's efficiency in learning new words. Using a looking-while-listening paradigm, 2-year-old children were taught the names of novel objects, with exposures either repeated across successive sentences or distributed throughout labeling episodes. Results showed successful learning only when label-object pairs had been repeated in blocks of successive sentences, suggesting that immediate opportunities to detect recurring structure facilitate young children's learning. These findings offer insight into how the information flow within CDS might influence vocabulary development, and we consider the findings alongside research showing the benefits of distributing information across time.

Keywords: child-directed speech, word learning, repetition, language development

Previous research on child-directed speech (CDS) suggests that young children who hear more language from caregivers often have larger vocabularies later in childhood (Hart & Risley, 1995; Hoff-Ginsberg, 1998; Weisleder & Fernald, 2013), but there is little empirical work aimed at determining the specific features of CDS underlying this relationship. Recent experimental and corpus-based studies have identified one particular feature of natural CDS that is likely to influence young children's word-learning abilities: parents' tendency to use the same words repeatedly in adjacent sentences (Brodsky, Waterfall, & Edelman, 2007; Hills, 2013; Onnis, Waterfall, & Edelman, 2008). The present study investigates how the use of repeated object labels in successive sentences affects young children's efficiency in learning new words.

Since Newport, Gleitman, and Gleitman (1977) first characterized 'motherese,' studies have shown that infants—even newborns—prefer to listen to CDS compared to adult-directed speech (Cooper & Aslin, 1990; Pegg, Werker, & McLeod, 1992; Werker & McLeod, 1989; Werker, Pegg, & McLeod, 1994). Researchers have also characterized the extent to which infants' preference remains intact over the course of early development, and how specific properties of CDS engage attention, e.g., prosody, repetition, and utterance length (Cristia, 2013; Hayashi, Tamekawa, & Kiritani, 2001; Newman & Hussain, 2006; McRoberts, McDonough, & Lakusta, 2009; Saint-Georges et al., 2013; Segal & Newman, 2015).

Another domain of research suggests that CDS is not only interesting to infants and young children, but also useful for their learning. Exposure to CDS—as opposed to overheard, adult-directed speech—enhances children's language development (Weisleder & Fernald, 2013), and greater lexical and grammatical diversity in CDS has a positive influence on children's vocabulary growth (e.g., Hoff & Naigles, 2002; Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010; Rowe, 2012). In addition to these correlational studies, experimental work has uncovered particular features of CDS that are thought to drive successful learning. For example, the exaggerated prosody of CDS influences word segmentation and word recognition in infants (Shukla, White, & Aslin, 2011; Singh, Nestor, Parikh, & Yull, 2009; Thiessen, Hill, & Saffran, 2005), the presence of isolated words promotes statistical word segmentation (Lew-Williams, Pelucchi, & Saffran, 2011), the use of common sentence frames, such as "Look at the . . .", helps infants identify familiar nouns (Fernald & Hurtado, 2006), and socially contingent interactions support word learning (Roseberry, Hirsh-Pasek, & Golinkoff, 2014). However, there is a relevant, outstanding property of CDS that has not been directly tested as an influence on young children's learning: the structure of words and sentences across time.

Repetitions and partial repetitions of utterances have long been characterized as a defining structural feature of CDS (Hoff-

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Ginsberg, 1985, 1986; Newport, Gleitman, & Gleitman, 1977; Snow, 1972). Recent analyses of language corpora have suggested that a range of 20–58% of CDS utterances contain words that are repeated in neighboring utterances, also known as partial self-repetitions or variation sets (Küntay & Slobin, 1996; Onnis, Waterfall, & Edelman, 2008). The following sequence of child-directed utterances—taken from the Providence corpus of the CHILDES database (MacWhinney, 2000)—provides one example of partial repetition:

> Mother: Bear needs a hat, will daddy's yellow hat fit?
>
> Mother: No, the yellow hat is too big.
>
> Mother: See the hat?

While the cumulative frequency of individual words in caregivers' speech is related to children's learning of those words (Goodman, Dale, & Li, 2008; Hart, 1991; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Naigles & Hoff-Ginsberg, 1998; Schwartz & Terrell, 1983) and repetitiveness of caregivers' speech (specifically, the ratio of word types to word tokens) predicts later vocabulary (Newman, Rowe, & Bernstein Ratner, 2015), less is known about how the spacing of exposures to words over time (e.g., partial repetition across utterances) also influences early word learning. In line with Goldstein et al.'s (2010) theoretical framework proposing that learners integrate regularities over brief windows of time, a study with adult participants found that repeating lexical items across successive sentences improved language learning (Onnis, Waterfall, & Edelman, 2008). Participants were exposed to speech in an artificial language that either repeated words across 20% of successive sentences, or repeated no words across successive sentences. Although all participants heard identical sentences over the course of the experiment, only participants who heard words embedded in neighboring sentences were later able to recognize words from the artificial language, suggesting that the temporal distribution of words in the input influenced learning. Immediately repeated structure also seems to benefit young children's language learning (see Horst, Parsons, & Bryan, 2011). In a longitudinal study of speech in parent–child dyads (ages 14–30 months), parents' partial repetitions of multiword constituents were correlated with children's later production of those constituent structures (as cited in Brodsky, Waterfall, & Edelman, 2007).

Previous research on CDS and partial repetitions has (a) identified word-level redundancies in parents' speech to their children, (b) demonstrated a link between this type of structured input and language learning in adults, and (c) shown that syntactic repetition in neighboring sentences is linked to children's later production of those constructions. The present study is the first, to our knowledge, to test whether repeating object labels across successive sentences—relative to distributing exposures across the input as a whole—affects children's abilities to learn multiple new words. Two-year-old children were taught three novel words in one of two conditions. In a *Structured* condition, object labels were repeated across blocks of successive sentences. In an *Unstructured* condition, children heard identical sentences, but object labels were distributed throughout the learning phase. At test, children viewed pairs of the novel objects and heard sentences referring to one of them (e.g., "Where is the fep?"). If partial repetition across successive sentences is an irrelevant cue to children's word learning relative to frequency of words in the input (or to features of CDS known to influence learning, such as prosody or utterance length), children should show no differences in accuracy looking to target objects at test. However, given that partial repetition of words across successive sentences is a salient feature of natural CDS, and given previous research suggesting that there may be a link between partial repetition and language learning, we predicted that children in the Structured condition would demonstrate greater accuracy in looking to the target objects than children in the Unstructured condition.

Method

Participants

Participants were 40 children aged 24- to 35-months ($M = 29.26$ months, $SD = 3.65$), an age range shown in previous research to be marked by substantial vocabulary growth and improvement in language processing capabilities (Bion, Borovsky, & Fernald, 2013; Fenson et al., 1994; Fernald, Thorpe, & Marchman, 2010). Twenty-five participants were girls, and all participants came from monolingual English-speaking homes. Children had no history of hearing problems or pervasive developmental delays. Twenty children were randomly assigned to each of two experimental conditions: a Structured condition and an Unstructured condition, described in detail below. Twenty-one additional participants were tested but not included because of fussiness ($n = 11$), instrument error ($n = 4$), inattentiveness (i.e., looking away from the screen throughout more than 50% of trials in the learning or test phase, $n = 5$), or parental interference ($n = 1$).

Stimuli and Design

Three novel words—*fep*, *dax*, and *coro*—corresponded to one of three pictures of novel objects, each characterized by a different color, texture, and shape (adapted from Horst & Hout, 2015). Each target word was 682–692 ms in length, and each picture was displayed at 10.1 × 13.9 in. Half of participants saw one set of word-object pairings, and half saw a second, counterbalanced set of pairings. All participants heard each word two times in each of three sentence frames ("Do you know what a ___ is?/ Wow, this ____ looks neat./ Can you find the ____ there?"). All words and sentences were recorded in a child-directed manner by a female native English speaker in a soundproof booth, edited in Praat, and set to a 65 dB intensity level. During the experiment, visual stimuli were displayed on a 55-inch TV, and audio was projected from laterally placed speakers.

In the Structured condition, blocks of three adjacent sentences in the learning phase referred to the same object, with partial repetition of object labels across sentences (e.g., "Do you know what a fep is?/ Wow, this fep looks neat./ Can you find the fep there?"). There were two blocks of labeling sentences for each novel word-object pair. The Unstructured condition consisted of identical sentences labeling the same three novel object pictures, but trials within each block of the learning phase were pseudorandomly ordered such that no two adjacent sentences referred to the same object (e.g., "Do you know what a fep is?/ Wow, this coro looks neat./ Can you find the dax there?"). Total number of exposures to each word and total time each object appeared on the screen was controlled across conditions. The average time between successive repetitions of the same object label within blocks in the Structured condition was 3.31 s (range: 2.84–3.77, SD = 0.3), and the average time between successive repetitions of the same object label across the Unstructured condition was 15.69 s (range: 10.50–24.18, SD = 5.12). Average timing between labeling instances was not significantly different for each of the three novel words in the Structured condition (p = .9) or Unstructured condition (p = .8).

Procedure

Participants were seated on a parent's lap, approximately 36 in. from the monitor. Parents wore opaque sunglasses and were instructed not to interfere during the experiment. Participants were randomly assigned to either the Structured or Unstructured condition.

In the *learning phase* (see Figure 1A), each novel object picture was shown by itself for 3 s, with a blank screen displayed for 300 ms between pictures. Each sentence began 200 ms after picture onset, and lasted an average of 2.4 s (range: 2.1–2.8). There were 18 labeling trials in the learning phase (six per object), plus five attention-getting filler trials, which occurred between sets of three labeling episodes. Filler trials consisted of pictures and videos with accompanying sounds or child-directed utterances (e.g., a train animation with a voice saying "Choo-choo!" or a picture of puppies and a voice saying "Look at the puppies!"). Two counterbalanced trial orders were used across participants.

The *test phase* (see Figure 1B) was presented immediately after the learning phase, following a 4-s attention-getting filler trial, and was identical for both conditions. The test phase followed a looking-while-listening design (see Fernald, Zangl, Portillo, & Marchman, 2008). On each test trial, participants saw a pair of two of the novel object pictures positioned on the left and right sides of the screen. Test sentences asked participants to identify one of the objects (e.g., "Where is the fep? Do you see it?"). Each test trial was 5.7 s total. Pictures were shown in silence for 2 s, followed by the test sentences, which lasted 2.7 s. There were 18 test trials, with each novel word-object pair tested six times. Similar to the learning phase, the test phase also included five attention-getting filler trials, which occurred after every three test trials. Two counterbalanced test orders were used across participants.

Additionally, children's vocabulary was assessed using the MacArthur-Bates Communicative Development Inventory: Words and Sentences (Fenson et al., 2007). The MCDI is a standardized measure of children's expressive vocabulary based on parental report, using a checklist of 680 words.

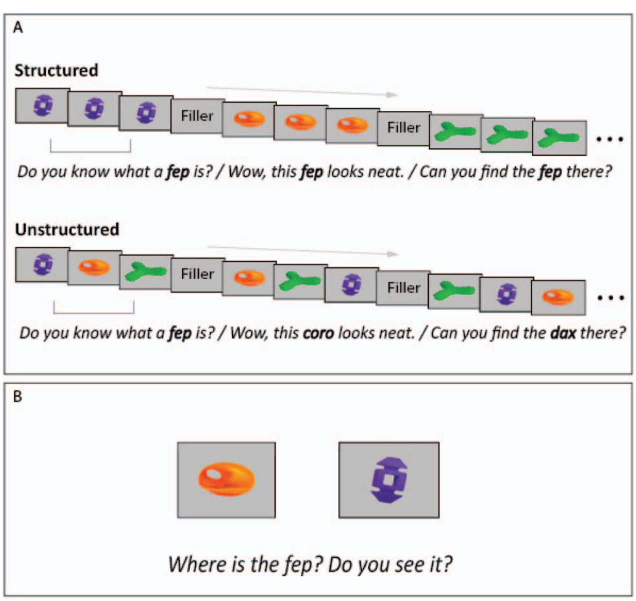

Figure 1. Experimental procedure. (A) Example trial orders showing objects labeled over time in the learning phase for participants in the Structured and Unstructured conditions. (B) Example test trial, where two of the novel objects appeared side-by-side, and participants heard sentences referring to one of them (e.g., "Where is the *fep*?"). See the online article for the color version of this figure.

Coding

Patterns of eye gaze were coded offline, frame by frame, at 33 ms intervals. Each child's eye gaze was coded as 'left' if looking at the left picture, 'right' if looking at the right picture, 'off' if shifting between pictures, or 'away' if not looking at either picture. Trials where the child looked away at noun onset or looked away for more than 15 consecutive frames were excluded from analyses. There was no significant difference in the total number of test trials included in analyses for the Structured condition (M = 11.2, SE = .77) and the Unstructured condition (M = 10.8, SE = .92), $t(38)$ = .29, p = .77, d = .09. To assess reliability, 25% of videos were coded by a second researcher. The overall proportion of frames on which coders agreed on gaze location averaged 97.9%. A more conservative reliability estimate measuring the mean proportion of frame agreement during shifts in gaze averaged 96.3%.

Results

Children's accuracy in looking to target pictures during the test phase was the primary measure of word learning, as in other studies of novel word processing (e.g., Bion, Borovsky, & Fernald, 2013). Reaction time (i.e., mean latency to shift from the distracter picture to the target picture) was also calculated (see Fernald et al., 2008), but a two-tailed independent-samples t test revealed no significant difference in mean reaction time (RT) between the Structured and Unstructured conditions, $t(37)$ = 1.45, p = .15, d = .48.

Accuracy was calculated as participants' total time looking to the target picture divided by their total time looking to either picture on each test trial, within a time window of 300 to 2,000 ms after noun onset, in accordance with previous research on young children's language processing (Fernald et al., 2008). Trials were included in analyses if children were looking at either the target or the distracter object at noun onset. Figure 2 displays children's accuracy in looking to the target referent in the Structured condition (M = .59, SE = .02) versus the Unstructured condition (M = .51, SE = .02) within the analysis window. A two-tailed independent samples t test revealed a significant difference in accuracy between the Structured and Unstructured conditions, $t(38)$ = 2.27, p = .029, d = .74. Moreover, accuracy was significantly greater

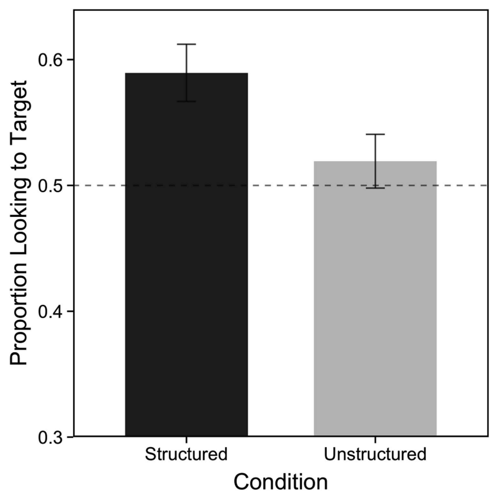

Figure 2. Mean proportion of looks to the target picture (i.e., accuracy) following noun onset for the Structured and Unstructured conditions. The dotted line shows chance levels of looking. Error bars show *SE*s across participants.

than chance (with chance defined as 50% looking to the target) in the Structured condition, $t(19) = 4.17$, $p < .001$, but not in the Unstructured condition, $t(19) = 0.91$, $p = .38$, suggesting that participants only learned the novel words in the Structured condition.

One possible explanation behind children's ability to learn the words only in the Structured condition is that they showed increased attention to the novel word-object pairs during the learning phase. Recent research with adults has shown attention to be spontaneously drawn toward regularities in the environment (Zhao, Al-Aidroos, & Turk-Browne, 2013), so in a similar way, children's attention might be more drawn to the temporally aligned word exposures in the Structured condition. To explore whether children's attention differed by condition, attention during the learning phase was quantified as the mean proportion of time looking to the stimuli during the learning phase. Results of an independent-samples *t* test showed no significant difference in attention in the Structured ($M = .77$, $SE = .02$) versus Unstructured conditions ($M = .74$, $SE = .02$), $t(38) = .98$, $p = .33$, $d = .32$, suggesting that both groups of children were equally attentive while learning the novel words.

It is also possible that children not only learned word-object associations during the learning phase, but throughout the test phase as well. That is, continuing to hear object labels in the presence of their associated object pictures could have promoted children's learning, as young children have been shown to learn word-object associations on ambiguous trials through cross-situational word learning (e.g., Smith & Yu, 2008). However, a paired-samples *t* test across both conditions showed no significant difference in accuracy between the first nine and last nine test trials across participants, $t(36) = -.68$, $p = .50$, $d = -.11$, and there were no significant differences within either condition (Structured: $t(18) = -.63$, $p = .54$, $d = -.14$; Unstructured: $t(17) = -.28$, $p = .78$, $d = -.07$), suggesting that children's word learning did not improve over the course of the test phase.

Finally, we examined effects of age on children's novel word learning, as our participants spanned the full range of the third year of life (24 to 35 months). Between conditions, there were no significant differences in mean age (Structured: $M = 29.56$, $SE = .86$; Unstructured: $M = 28.96$, $SE = .79$; $t(38) = .52$, $p = .61$, $d = .17$) or mean MCDI vocabulary scores (Structured: $M = 502.6$, $SE = 38.77$; Unstructured: $M = 488.8$, $SE = 31.58$; $t(38) = .28$, $p = .78$, $d = .09$). In the analyses that follow, we focus on effects of age, as age and vocabulary scores were highly correlated in our sample, $r = .65$, $p < .001$, and vocabulary scores did not account for a significant proportion of variance in accuracy after controlling for age, $\beta = .17$, $t(36) = .86$, $p = .40$. A multiple regression model including condition (Structured vs. Unstructured), age, and an age-by-condition interaction term accounted for 30% of the variance in participants' accuracy, $R^2 = .30$, $F(3, 36) = 5.15$, $p = .005$, with condition and age each making a significant contribution (Condition: $\beta = .32$, $t(36) = 2.27$, $p = .029$; Age: $\beta = .32$, $t(36) = 2.28$, $p = .029$), and the interaction term making a marginally significant contribution ($\beta = .26$, $t(36) = 1.83$, $p = .076$). To examine this age effect more carefully, we looked at differences in performance between younger and older 2-year-old participants (see Figure 3), with age groups based on a median split (median = 28.75). For the younger group, there was no significant difference in accuracy between the Structured ($M = .53$, $SE = .03$) and Unstructured conditions ($M = .52$, $SE = .03$), $t(18) = .32$, $p = .75$, $d = .15$, and accuracy was not significantly above chance in either condition (Structured: $t(9) = 1.18$, $p = .27$; Unstructured: $t(9) = .45$, $p = .66$). However, for the older group, there was a significant difference in accuracy between the Structured ($M = .64$, $SE = 02$) and Unstructured conditions ($M = .52$, $SE = .02$), $t(18) = 3.71$, $p = .002$, $d = 1.75$, and accuracy was significantly above chance in the Structured condition, $t(9) = 6.71$, $p < .001$, but not in the Unstructured condition, $t(9) = .91$, $p = .39$. Thus, only older 2-year-olds in the Structured condition showed successful learning of the novel words.

General Discussion

The present study revealed that 2-year-old children were able to learn multiple new words after hearing labels repeated across neighboring sentences, but not after hearing labels interleaved throughout a laboratory-based learning session. While overall frequency of exposure to words in children's language input may be key for language development, our findings show that the spacing of object labels across time is also important for facilitating early word learning. Understanding at a gross level that the use of CDS facilitates language learning can help explain young children's markedly different trajectories of vocabulary growth, but here, by examining partial repetition of words in adjacent sentences, we spotlight a specific, naturally occurring structural feature of CDS that helps define 'high-quality' language input.

The present results are somewhat surprising given research on the spacing effect in word learning, which has shown that temporally protracted exposures to novel words enhance young children's learning and memory of those words (e.g., Childers & Tomasello, 2002; Vlach, Sandhofer, & Kornell, 2008). However, our findings are not contradictory to previous work; rather, they point to a need to look at behavior and learning across time scales. While distributed exposures may influence long-term memory,

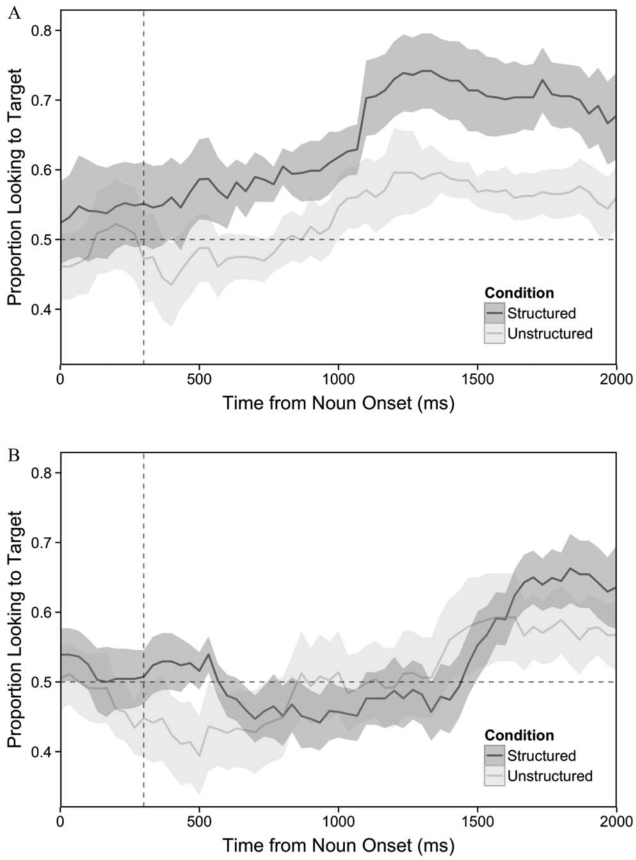

Figure 3. Change over time in mean proportion of looks to the target beginning at noun onset for the Structured and Unstructured conditions, with separate graphs displaying looking times for the older half of participants (A) and younger half (B). Accuracy looking to the target was measured starting at 300 ms (as noted by the dashed vertical line) to account for the amount of time it takes to program an eye movement. The horizontal dashed line shows chance levels of looking to the target object. Error bands show *SE*s across participants.

immediate opportunities to detect recurring sound sequences seem to be important for facilitating the encoding and short-term retention of multiple label-object pairs. McMurray, Horst, and Samuelson (2012) offer a related viewpoint on how timescale factors influence learning, proposing that children face two distinct word-learning problems: resolving ambiguity of word-object pairs in real-time, and learning words over multiple encounters (see also Kucker, McMurray, & Samuelson, 2015). Thus, the benefit of blocked exposure is likely to depend on context, much as research on category learning has revealed context-dependent effects of blocked versus interleaved exposures. Carvalho and Goldstone (2014) demonstrated that blocked exposures result in better category learning for low-similarity categories, but interleaved exposures facilitate better learning for high-similarity categories. Similarly, in word learning, distributed exposures may be more beneficial for word retention over a longer timescale, but the present results suggest that in the context of learning over a shorter timescale, partial repetition across successive sentences may be particularly important for enabling children to establish correct word-object associations.

Learning in our task was driven by the older half of participants: only older 2-years olds who heard partial repetition of words across successive sentences were able to learn successfully. Considerable changes in vocabulary and processing skills occur over children's third year of life (e.g., Bion, Borovsky, & Fernald, 2013; Fenson et al., 1994; Fernald, Thorpe, & Marchman, 2010), and our results converge with these findings in showing differences in language learning abilities between younger and older 2-year-olds. It is possible that this type of partial repetition differentially helps older 2-year-olds; that is, in natural communication, parents' use of repetition in successive sentences might not facilitate younger children's mapping of labels to objects. However, task complexity is also a plausible explanation for the observed age effects. Learning multiple new words within a brief period of time is demanding for young children, so success on our task may depend on age-related changes in cognitive and language abilities. The potentially taxing nature of learning multiple new words could also help explain why RT—a common measure of language processing for familiar words—did not capture children's learning in our task. Regardless of the locus of age differences, older 2-year-olds' learning of new words in the context of partial repetition indicates that the spacing of object labels over time in CDS is a relevant cue influencing word learning.

However, an important question remains: what aspects of partial repetition enabled successful learning of novel word-object pairs for older 2-year-olds? There are several related but distinct explanations for the beneficial effect of repeated structure on word learning, each placing emphasis on different aspects of cognition.

One possible explanation is attention-based: repeated elements might become more salient and easily learnable simply by being presented in close proximity. Recent research has shown that human attention is spontaneously biased toward input that contains regularities (Zhao, Al-Aidroos, & Turk-Browne, 2013). Relatedly, infants have been shown to pay more attention to visual and auditory stimuli when information is neither too simple nor too complex (Kidd, Piantadosi, & Aslin, 2012, 2014). Given that the present experiment was a short, fast-paced word-learning study, repeated structure might engage children's attention by enabling them to detect the most relevant content from the input. Yet, in line with research showing that the lexical repetition characteristic of CDS does not influence older infants' attention (Segal & Newman, 2015), we found no difference in children's overall attention to partially repeated versus distributed word-object exposures (i.e., mean proportion of time looking to the novel objects during the learning phase was the same in both conditions). However, our attention measure does not capture potential differences in general auditory attention or encoding of perceptual detail (e.g., children's examinations of specific features of the novel objects), either of which may have contributed to children's improved word learning in the context of structured input.

A related second possible explanation is that hearing novel words repeated in successive sentences strengthens subsequent processing of those words in new sentential contexts. Weisleder and Fernald (2014) proposed that hearing words multiple times in a variety of sentence constructs gives children more opportunities to practice processing familiar words, and in doing so, enables them to learn new lexical and sentential information. In this vein, hearing a novel word repeated in a subsequent sentence may provide young children with an immediate opportunity to practice processing that word in a new context, and this may enhance their ability to process novel information that comes moments later. Speed of processing has been shown to predict later vocabulary outcomes (e.g., Fernald, Perfors, & Marchman, 2006; Hurtado, Marchman, & Fernald, 2008; Marchman & Fernald, 2008; Weisleder & Fernald, 2013), suggesting that early differences in children's ability to process new words can have cascading effects on continued vocabulary growth. Importantly, in the present study, more than just words repeated across time. The visual signal also contributed to the processing of new objects and words. In the Structured condition, young children had immediately repeated opportunities to process the visual features of novel objects, but this was not the case in the Unstructured condition. The manner in which we presented objects was controlled across conditions, with an object disappearing and reappearing between each labeling instance, but in natural contexts of word learning, objects have a less interrupted presence in the visual field as caregivers describe them in successive utterances—and they are also coupled with dynamic motion and social cues. Thus, outside of the laboratory context, processing of visual/auditory information over time is likely to be different, and perhaps play a more substantial role in learning.

Third, repetitive structure in children's language input may not just engage attention or enhance processing, but also enable children to more successfully bind together similar learning events and form memories of word-object pairings. Indeed, Smith and Yu (2013) found that moment-to-moment attention to objects in a cross-situational word learning task was not sufficient for forming word-object mappings, suggesting that successful learning requires binding word-object pairs into memory as opposed to simply forming transient representations. In related work, Vlach and Johnson (2013) proposed that massed—as opposed to distributed—exposures to word-object pairings in a cross-situational statistical learning task facilitate more successful learning by allowing children to aggregate statistical information across trials to form stable memory representations of those pairings (see Kachergis, Yu, & Smith, 2009, for comparable results on the importance of temporal contiguity with adult participants). Similarly, in our word-learning task, immediate repetition of words across successive sentences may have enabled stronger binding of labeling instances to their referents and helped children form more stable memories of word-object pairs. Thus, while interleaving instances of labels across lengths of time may facilitate better long-term memory for new words (e.g., Childers & Tomasello, 2002; Vlach, Sandhofer, & Kornell, 2008), immediate repetition of words over shorter timescales may be important for helping children form successful memories of word-object pairs in the first place.

A final explanatory possibility emphasizes a distinct locus of cognition: if word-object pairs are presented repeatedly across successive sentences, this may suggest to young children that the repeated information is of pedagogical importance. That is, young children could interpret repeated use of a word across sentences as a parent's explicit attempt to teach them something. According to theories of natural pedagogy, ostensive communicative cues, including infant-directed speech, drive young children to interpret adults' object-directed behavior as indicating relevant information (e.g., Csibra, 2010; Csibra & Gergely, 2009; Gergely, Egyed, & Király, 2007). Thus, caregivers' repetitive use of words across short time scales may serve as a communicative cue that highlights the importance of a word-object pair. Because repetition is common in CDS, children may infer that the speaker is trying to provide contextually or culturally important information, and therefore learn better from this type of structured input.

At present, it is unclear to what extent each of these mechanisms—attention, processing, memory, or pedagogy—underlies the finding that repetition of object labels across successive sentences enhances children's learning of new referents. Yet the fact that partial repetition facilitates 2-year-olds' encoding of word-object pairings provides an important step in characterizing the specific features of CDS that promote vocabulary development. These results also highlight the importance of understanding how input gives rise to language learning at multiple timescales. Distributing labels across time may help young children retain word knowledge, while repeating labels in successive sentences may boost children's initial learning of new words, which likely has cascading effects on later encounters of those words in diverse contexts.

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