Toddlers' use of grammatical and social cues to learn novel words

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Abstract

By their second birthday, children have begun using grammatical cues to decipher the meaning of newly encountered words. By 3 years of age, there is evidence that children are more reliant on grammatical than social cues to decipher verb meaning (Nappa, Wessel, McEldoon, Gleitman, & Trueswell, 2009). Here, we investigate children's reliance on grammatical and social information to infer the meaning of a novel noun. First we investigate the emergence of children's use of grammatical number markings to infer noun meaning. Then we explore how children integrate this cue with other (social) cues to word meaning. In Experiment 1, we demonstrate that children begin using grammatical number markings to resolve referential ambiguity by 24 months of age. In Experiment 2, we pit the grammatical number cue against a well-established social cue and find that 2-year-olds' reliance on grammatical number markings is already strong enough to compete with social eye gaze cues.

Words: 150/150

Children's referential mapping strategies develop rapidly over the first 3 years of life. Some of the earliest cues children use to determine word meaning are language-general cues like social eye gaze and perceptual salience (Baldwin, 1993; Pruden, Hirsh-Pasek, Golinkoff, & Hennon, 2006). However, by the age of 2, toddlers' have begun using the specific grammatical regularities of their native language as tools to decipher novel word referents (Bernal, Lidz, Millotte, & Christophe, 2007; Fisher, Hall, Rakowitz, & Gleitman, 1994; Naigles, 1990). Once acquired, grammatical cues tend to be more reliable than other cues to word meaning (Nappa et al., 2009, see Hollich, Hirsh-pasek, & Golinkoff, 2000, for related discussion). By 3 to 5 years of age children weigh certain types of grammatical information (i.e., the position of the subject and the object in the sentence) so heavily that they will ignore conflicting social information and map words based on syntactical structure alone (Nappa et al., 2009). But when do children come to rely so heavily on grammatical cues to word meaning? Do children view all grammatical cues as inherently reliable? Or is this reliance on grammatical information learned through experience? The aim of the current study is twofold. First, we determine at what age children begin to use grammatical number markings to learn the meaning of novel nouns. Then, we examine children's reliance on this newly learned grammatical cue relative to a well-established social cue.

By their second birthday toddlers have already begun to understand and produce grammatical number markings (Barner, Thalwitz, Wood, Yang, & Carey, 2007; de Villiers & de Villiers, 1973; Ettlinger & Zapf, 2011; Soderstrom, White, Conwell, & Morgan, 2007). By 24-months of age children can use spoken singular/plural markings to guide their online visual search for a referent. For example, upon hearing *"Look, there are some blickets"* children will direct their eye gaze towards a group of novel objects rather than a single novel object (Arias-

Trejo, Cantrell, Smith, & Alva Canto, 2014; Kouider, Halberda, Wood, & Carey, 2006). Although this is evidence that 24-month-olds can use grammatical number markings to resolve referential ambiguity, Kouider et al. (2006) and Arias-Trejo et al. (2014) did not test whether 24-month-olds were able to use the number markings to learn the novel word-object pairings. In other words, children may look at the number matched object but may not show evidence of mapping the spoken label to that object. To directly examine word learning, our experiment includes trials that test children's recollection of the trained words in the absence of any disambiguating information.

Only one study has examined toddlers' use of grammatical number markings in the context of word learning (Jolly & Plunkett, 2008). This study looked specifically at toddlers' use of the plural noun inflection to map words to their referents but did not examine children's ability to learn the words when multiple grammatical number markings were present in the labeling utterances (i.e., number markings on pronouns, determiners and verbs, as well as the plural inflectional ending on the noun). In the Jolly and Plunkett study, 24- and 30-month-olds were presented with a single novel object on one side of the screen and a pair of novel objects on the other side. The images were accompanied by a passage labeling the object/s using either the singular (i.e., 'jeel') or the plural inflected noun form (i.e., 'jeels'). When toddlers' were tested on their knowledge of the novel words, only 30-month-olds showed evidence of using the plural 's' inflection to map the words to their referents.

Jolly and Plunkett (2008) concluded that 24-month-olds cannot use number markings to resolve referential ambiguity. However, 24-month-olds might have been successful at this task if they were provided with additional number markings on the determiner and verb forms. Evidence in support of this hypothesis is provided by online comprehension studies

demonstrating that 24-months-olds will only direct their eye gaze towards an object or a group of objects when redundant plural/singular markings are used (Kouider et al., 2006). In the current study, we examine this possibility by testing whether 24-month-olds can successfully use grammatical number in a word learning task if the plural/singular form is marked redundantly.

In our second experiment, we aim to investigate how children weigh markers of grammatical number relative to other well-established word learning cues. More specifically, we examine how children react when presented with conflicting grammatical and social cues to word meaning. Social eye gaze cues emerge around 18- to 19 months of age (Baldwin & Moses, 2010; Baldwin, 1993). By pitting recently learned grammatical information against this well-developed social cue, we will be able to gauge children's initial reliance on grammatical number cues at a time when they have just been learned.

No work to date has examined how 2-year-olds weigh grammatical information relative to other word learning cues when trying to work out the meaning of a novel noun. There is evidence that children's use and reliance on some strategies (like social eye gaze) develops over time. For example, even though 12-month-olds can follow a speaker's eye gaze, it is not until 6 months later that eye gaze information takes precedence over conflicting perceptual salience information in a novel word learning task (Hollich, et al., 2000). If grammatical cues follow a similar trajectory then children may initially place less weight on grammatical number information relative to other more established cues.

Alternatively, toddlers may weigh all grammatical strategies heavily, regardless of how long they have had the cue in their word-learning repertoire. There is evidence that in some circumstances children tend to place greater weight on grammatical cues relative to other types of disambiguating information. In one study, 3- to 5-year-old children were presented with an

ambiguous scene of an elephant and a rabbit that could be interpreted as 'chasing or fleeing'. When the linguistic context of the verb was uninformative (i.e, the speaker said, *"He's blicking him"*) children mapped the verb 'blicking' to the subject/agent that the speaker was looking at. However, when the linguistic context and eye gaze conflicted, (i.e., if the speaker said *"the rabbit is mooping the elephant"* while looking at the object instead of the subject), children decided that the relational verb '*mooping'* meant 'to chase' or 'to flee' based on the grammatical subject in the sentence, thus indicating that children are relying on grammatical information to decipher the verb referent (Nappa et al., 2009). However, we do not know if grammatical number cues will be weighted as strongly in younger children when they are presented with novel concrete nouns (rather than novel verbs). Experiment 2 will address this issue by presenting 2-year-olds with conflicting eye gaze and grammatical number cues to the meaning of a novel noun.

In this series of experiments, we first examine when young children comprehend grammatical number enough to use it to bootstrap the meaning of novel words (Experiment 1). Then we begin to explore toddlers' reliance on the grammatical number relative to other types of disambiguating information (Experiment 2). Taken together these experiments provide novel advances to our understanding of how children integrate newly learned grammatical cues into their developing repertoire of word-learning strategies.

Experiment 1

In Experiment 1, we examine 22- to 25-month-olds' ability to use grammatical number markings to map words to their referents. When number is marked using only the plural '-s' inflection, there is evidence that 24-month-olds are unable to use it to decipher novel noun referents (Jolly & Plunkett, 2008). However, Kouider et al. (2006) showed that 24-month-olds can use redundant

number markings to direct their gaze towards the corresponding object/s. Thus, in the training phase of the current study, we replicate Kouider et al. (2006) by demonstrating that children can use grammatical number markings (on the pronoun, determiner, verb, and noun forms) to direct their gaze towards the appropriately labelled object/s. Then, in the test phase, we examine whether children were able to use the singular/plural number markings to attach the novel labels to their referents.

The Preferential Looking Paradigm was used to sequentially train and test 24-month-olds on four novel words. During the training phase, the only information available to determine whether the novel word referred to the pair of objects or the singular object was the speaker's use of the plural or singular form. During the test phase, children were presented with two side-by-side images of novel objects and were instructed to look at one of the novel objects. If children looked to the appropriate object when asked, then this would indicate that they were able to use the grammatical cue provided in the training phase to determine which object the novel noun referred to. We predicted that if children can use grammatical number cues then they should map novel words to the *pair* of novel objects when the novel word is used in a plural sentence frame and to the *singular* object when it is used in a singular sentence frame.

Method

Participants. Twenty 22- to 25-month-olds (M_{age} = 742 days; range = 688 – 773 days, 8 females) from the Greater Toronto Area were tested. According to parental reports, all participants received at least 90% English language input. Five participants were excluded from the study (three due to fussiness and two because their proportion of looks to the target object in the test phase were greater than 2*SD*s away from the group mean).

Stimuli. The visual stimuli consisted of two static images presented side-by-side on a white background. All of the novel objects were animate creatures (with eyes) and were approximately matched for size and interest. Images were accompanied by sentences labeling one of the objects. All auditory stimuli were produced in an infant-directed manner by a female native English speaker. The warm up and training trial stimuli were recorded in a variety of singular and plural sentence frames. For the test trial stimuli, the target words were recorded in the frames *"Look at the __. Do you like IT?"* and *"Look at the ____S. Do you like THEM?"*. The audio and visual stimuli were combined to create four 3.5 minute videos consisting of 24 trials. A 2 s flashing white star was inserted before each trial to attract the toddler's attention to the center of the screen.

Design. Each child was randomly assigned to watch one of the four orders. All four orders trained and tested children on four novel words (blicket/s, miggy/ies, toma/s, zurpel/s). Within each order, the target image appeared an equal amount of times on the left and right sides of the screen. Each target was paired with the same distractor throughout the training and test phases. However, the object/s that were selected to be the target/s and the object that were selected to be the distractor/s were counterbalanced across orders so that the target/s in one order were the distractor/s in another. The order of presentation of the trials was also counterbalanced across videos.

Procedure. Children watched the video while sitting on their parents lap in the center of a sound attenuated booth. Parents were asked to wear closed headphones and listen to masking music to prevent them from biasing their child's responses (Pinto, Fernald, McRoberts, & Cole, 1998).

In each of the four blocks the child was trained and tested on one of the four novel words (see Figure 1). Blocks began with two 6 s warm-up trials in which an image of a familiar object (e.g., a ball) was shown alongside another pair of familiar objects (e.g., two cars). One of the objects was then labeled in its plural or singular form and at the end of the trial the labeled object would jiggle. Warm-up trials were followed by two 6 s training trials. In one of the training trials a picture of a single target object was presented alongside a picture of two distractor objects and the object was labeled twice in its singular form using the sentence frame *"Where IS the ___? Can you see A ___?" or "THIS IS A nice ___. Do you see A ___?"*. In the other training trial, a pair of target objects was presented alongside a single distractor object, and the target word was labeled twice in the plural form using the sentence frame "*THESE ARE nice ___S; Can you find the ___S" or* "*Where ARE the ___S? Can you point to the ___S?"*. The only cues to decipher the target word referent were the auditory singular/plural markings in the training phase.

In the test phase, children were presented with two 6 s test trials. The trials showed images of the target and distractor objects, along with an auditory passage asking children to look at the target object/s (e.g., *"Look at the ___. Do you like it?" or "Look at the ___S. Do you like THEM?"*). In each test trial, the target word onset occurred 3 s after the images appeared on the screen. Here the objects were matched in number (i.e., one of the target and one of the distractor, or two of the target and two of the distractor), thus, if the child was unable to use the grammatical cues to infer the target object, no differences should be seen between the looking times to the target and distractor objects. The entire procedure was videotaped for offline coding.

----Insert Figure 1 about here----

Coding. The video recordings of children's eye movements were hand-coded offline with the audio track disabled. Each 33ms frame was coded as a look to the left image, right image or away. Two of the videos were re-coded by a second coder and reliability was high (mean r = .97, SD = .04).

Results and Discussion

First we analyzed children's looks to target during the training phase. The mean proportion of fixations to the target object/s was computed by dividing the number of fixations to the target by the total time spent looking at both objects (see van Heugten & Johnson, 2011). An average portion of looks to target in the 1-second window following the disambiguation point of the first singular/plural marking in the sentence frame was then computed across training trials. When compared to chance (.5), children looked significantly more to the object/s that corresponded in number to the plural/singular markings in the sentence frame, M = .56; t(19) = 2.87, p = .010, d = .64. The results of the training trials replicate the findings of Kouider et al. (2006), demonstrating that 24-month-olds will direct their online eye gaze in response to the plural/singular markings in the sentence frame.

Next we analyzed children's looks to target during the test trials. Here we examined whether children learned the word-object pairing by comparing the average proportion of fixations to the target object in the 1-second time window following target word onset to chance. A two-tailed one-sample t-test indicated that the target object was fixated more than the distractor, M = .56; t(19) = 2.60, p = .018, d = .58, indicating that 24-month-olds were able to map the target word to its referent based on the grammatical cues in the training phase. The effect size was only in the medium range, which prompted us to examine how children's age

might relate to performance in this task. Interestingly, test performance was positively correlated with age, with the older children in the sample tending to out perform their younger counterparts, $r(19) = .62$, $p = .004$ (see Figure 2). This correlation suggests that the ability to use the grammatical number as a word-learning strategy emerges between 22 and 25 months of age. Indeed, if we split our sample in half by age, the older (>750 days old) and younger (<750 days old) children in the group seem to be performing differently, $t(18) = 1.98$, $p = .063$, $d = .89$. The older half of the sample are fixating the target, whereas, $M = .61$, $t(9) = 3.24$, $p = .010$, $d = 1.02$ the younger half are at chance, $M = .52$; $t(9) = .60$, $p = .565$, $d = .19$.

Interestingly, we found no correlation between eye gaze in the training trials and performance in the test trials, $r(19) = -.17$, $p = .49$. There are several different interpretations of this finding, including the possibility that we did not have enough variability in the training phase looking behavior to pull out a correlation.

----Insert Figure 2 about here----

Experiment 2

Experiment 1 demonstrated that by 24 months of age toddlers have begun using the plural/singular grammatical structure to infer the meaning of novel words. But once children have acquired the ability to learn new words using this information, how strongly do they rely on this strategy? In Experiment 2 we test a slightly older age group (i.e., 24- to 25.5-month-olds) and examine their reliance on grammatical number markings relative to another well-established word-learning strategy (i.e., social eye gaze). We tested a slightly older age group than in Experiment 1 to ensure the children were able to use number marking information in a word-learning scenario. We used a similar methodology to Experiment 1, but added a video of an onscreen woman to the training phase to deliver the social and grammatical cues. In each training

trial the woman turned her head to look at one of the objects and labeled the target object using a number marked sentence frame. In the divergent training phase the social eye gaze and the grammatical number cues pointed to different objects, whereas in the convergent training phase both cues referred to the same object.

In the convergent trials, we predicted that children would show robust learning of the words, as the grammatical and social information converge. In the divergent trials, there were several possible outcomes. Research with 3- to 5-year-olds suggests that older children rely heavily on grammatical cues (Nappa et al., 2009). Thus, even at 24 months of age, grammatical number cues might already be strong enough to override conflicting social information. Alternatively, it may be the case that even though older children favored grammatical cues in a novel verb-learning situation, children of all ages might not weigh grammatical information more heavily than social information in all types of word learning scenarios. In our novel noun-learning task 2-year-olds may rely more on social eye gaze than the recently acquired grammatical number cue. Finally, children may weigh both social and grammatical cues heavily at this age, resulting in no evidence for learning in the divergent condition.

Method

Participants. Twenty 24- to 25.5-month-old typically developing toddlers (M_{age}= 755 days; range = 726 – 779 days, 10 females) from the Greater Toronto Area were tested. According to parental reports, all children received at least 90% English language input. Three participants were excluded from the study prior to coding: two due to extreme fussiness, one due to equipment failure.

Stimuli. This experiment used the same novel objects and sentences as Experiment 1. In

the training phase children were shown a video of the speaker labeling the target object/s (see Figure 3). While verbally labeling the target object, the onscreen speaker turned her head 90 degrees to look at the object/s on her left or right side. Her head turn was approximately timed with the onset of the first singular/plural marking in the auditory passage. The test trials were identical to the test trials in Experiment 1. The audio and visual stimuli were combined to make two 3.5 minute videos.

Design. Participants were randomly assigned to watch one of two counterbalanced orders of the video. In all videos the first two words were taught using divergent training trials and the second two words were taught using convergent training trials. In each order, the target and distractor objects appeared an equal amount of times on the left and right sides of the screen. The order of the trials, as well as which objects were selected to be the grammatically and socially cued targets, were counterbalanced across children.

Apparatus and Procedure

Each divergent and convergent block contained two 16 s training trials and two 6 s test trials. To avoid altering the perceived reliability of the speaker, no warm-up trials were presented. In the training trials, a female speaker appeared on-screen and labeled the target object twice while turning her head towards the object or pair of objects located to her left or right. In the test trials, number matched objects were presented on screen accompanied by a passage cueing the target object. The only cues given to decipher the target word referent at test were the speaker's eye gaze and the singular/plural grammatical markings in the training phase.

In the convergent blocks, if children are able to use one or both of the cues in the training phase, then they should look to the target object when it is labeled at test. In the divergent blocks,

children's looking behavior at test will be determined by how they weighed the social versus the grammatical cue to word meaning in the training phase.

----Insert Figure 3 about here----

Coding. In the training trials each 33ms frame was coded as a look to the left image, right image, center image (onscreen woman) or away. The coding of the test trials was identical to Experiment 1. Two of the videos were re-coded by a second coder and reliability was high (mean $r = .98$, $SD = .02$).

Results and Discussion

First we analyzed children's looks to target during both the convergent and divergent training phases. Since we predicted that toddlers would rely heavily on grammatical information, we selected the grammatically cued object to be the target object for the analysis of both types of training phases. The portion of fixations to the target in the 1 s window after the disambiguating point of the first grammatical marking and simultaneous social head turn was computed by dividing the looks to the grammatically cued object by the total looks to both objects. One child was excluded from the training trial analysis because the video quality in the training phase was not clear enough to code[1]. In the convergent training trials, toddlers reliably fixated the target object that was redundantly cued by both the grammatical and social information, M = .73, $t(17) = 3.97$, $p = .001$, $d = .94$. In the divergent trials, a portion of fixations to the grammatical target above .5 indicates that the child fixated the grammatically cued target, whereas a portion less

[1] Children that failed to fixate either object/s during the target window were excluded from this analysis. These participants (n = 3 in the divergent training trials, and n = 1 in the convergent training trials) were looking at the speaker or off screen for the duration of the window of analysis.

than .5 indicates that they fixated the socially cued object. Here, toddlers fixated the socially cued object more than the grammatically cued object, M = .09, $t(15)= -11.27$, $p < .001$, $d = 2.82$. Thus, it seems children fixated the socially cued object regardless of training trial type during the training phase (see Nappa et al. 2009, for a similar result).

Next we analyzed children's looks to target during the test trials. As was expected, children showed greater looks to target in the convergent (M = .65, *SD* = .25) than the divergent (M = .43, *SD* = 0.25) test blocks, $t(19) = 2.81$, $p = .011$, $d = .63$. In convergent test trials, children looked at the social/grammatically cued target object when it was labeled during the test phase, M = .65; $t(19) = 2.63$, $p = .016$, $d = .59$ (see Figure 4). In the divergent test trials, children's word learning was at chance, indicating they did not reliably fixate on the grammatically or socially cued objects when they heard the label at test, M = .43; $t(19) = -1.24$, $p = .230$, $d = .28$. The mean is slightly below chance, which may suggest that some children could be mapping the word to the socially cued object. However this trend did not approach significance, thus we cannot draw any strong conclusions from this data. We do not see evidence that, as a group, children were able to learn the words when cues conflicted. However, when cues converged, children showed robust learning of the word-object pairing. This is an indication that even after they are first acquired, grammatical cues may already carry a fair bit of weight relative to well-established social cues. Importantly, when cues converged, children had no trouble determining which label belonged with which object, indicating that it was not the presence of multiple cues that inhibited learning. Rather, it was the conflict between these two relatively reliable cues that disrupted learning.

----Insert Figure 4 about here----

General Discussion

This is the first study to examine how toddlers weigh grammatical number information relative to other well-established referential cues in a novel noun-learning scenario. In Experiment 1, similar to Kouider et al.'s (2006) we found that children were able to use the grammatical number markings in the sentence frame to guide their online visual search for a referent. Then, we demonstrated that by 24 months of age children could use this information to learn the novel word-object pairings. In Experiment 2, we tested children's reliance on this newly learned grammatical strategy and found that even early on in its development, grammatical number may already be a strong competitor to well-established social cues.

The results of Experiment 2 suggest that when cues conflict, young children do not rely solely on grammatical or social information. Rather, word learning is disrupted because both cues carry substantial weight. In contrast to cue conflict studies with older 3- to 5-year-olds, in 24-month-olds we do not see complete reliance on the grammatical cue (i.e., Nappa et al., 2009). It is possible that over time children may place greater weight on grammatical over social information, or become more adept at dealing with conflicting cues. This is an issue we are currently investigating in our lab.

It is also possible that children may be using different strategies depending on whether the cue refers to a novel noun or a novel verb. Nappa et al. (2009) presented children with a social and grammatical cue to learn a novel verb whereas our study examined noun-learning. Grammatical information may be inherently favored in verb-learning tasks given that linguistic information may be necessary to constrain meaning in situations where verbs refer to absent actions or abstract states of "being" (Gentner & Boroditsky, 2001; Golinkoff & Hirsh-Pasek,

2008). In our concrete noun-learning task, it is plausible that social cues are more informative than they would be in a novel verb-learning situation.

Another alternative explanation for these results could be that children are not just following automatic cue weighting strategies, but they may be flexible in their use of cues, shifting their reliance to select the most informative cue in a given context. Perhaps the speaker in Experiment 2 was seen as unreliable because they were providing conflicting cues to word meaning. Support for this explanation is provided by studies suggesting that children take such circumstances into account when interacting with adult speakers (Jaswal, McKercher, & Vanderborght, 2008; Sabbagh & Baldwin, 2001).

Taken together this study contributes to our understanding of how grammatical strategies develop and how toddlers weigh information from different sources in early word learning. Future studies will investigate whether older children will respond similarly to situations in which grammatical number and social cues conflict.

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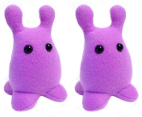
Trial	Left Screen	Audio	Right Screen
Warm-up 1		*"Where are the cars"*	
2		*"Look at the car. Do you like it?"*	
Training 1		*"THESE ARE nice blicketS. Can you find the blicketS?"*	
2		*"Where IS the blicket_? Can you see A blicket_?"*	
Test 1		*"Look at the blicket_. Do you like IT?"*	
2		*"Look at the blicketS? Do you like THEM?"*	

Figure 1. Sample block of trials from Experiment 1. The experiment consisted of four blocks, in which toddlers were trained and tested on one of four novel words. Each block contained two 6 s warm-up trials followed by two 8 s training and two 6 s test trials. In one of the two training trials a picture of a single target object was presented alongside a picture of two distractor objects and the object was labeled twice in its singular form (i.e., *"Where IS the blicket_?", "Can you see A blicket?"*). In the other training trial, a pair of target objects was presented alongside a single distractor object, and the plural form of the target word was given (i.e., *"THESE ARE nice blicketS.", "Can you find the blicketS?"*). In the test trials objects were matched in number and the onset of the target word occurred 2 s into the trial. One of the test trials tested the singular form of the novel word (*"Look at the blicket. Do you like it?"*) and other one tested the plural form (*"Look at the blicketS. Do you like THEM?"*).

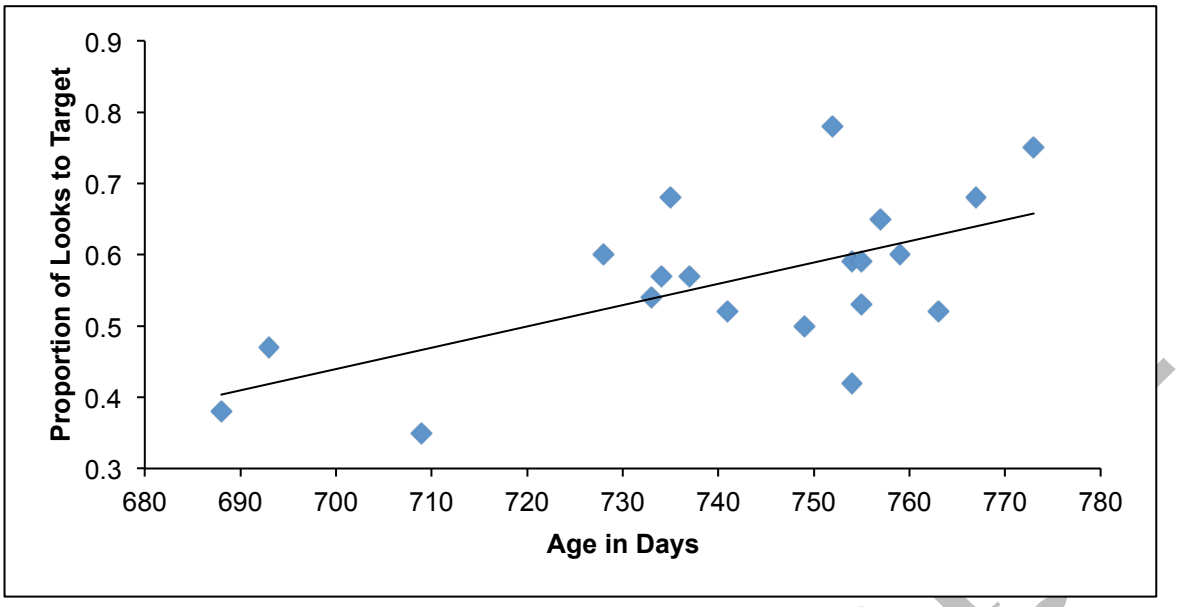


Figure 2. Mean Proportion of Looks to Grammatical target in Experiment 1 as a function of age in days. The line represents the linear relationship between age and the proportion of looks to the target in the 1s window of analysis, r(19) = .62, p = .004.

Divergent Training Trial	Convergent Training Trial
 *"THESE ARE nice zurpeIS. Can you find the zurpeIS?"*	 *"THESE ARE nice blicketS. Can you find the blicketS?"*

Figure 3. Sample of divergent and convergent training trials from Experiment 2. In the training trials, a single novel object was pictured alongside a pair of novel objects. Two seconds into each training trial a woman appeared and labeled the target object twice using a number marked sentence frame (i.e., the grammatical cue). While labeling the object, she turned her head towards the object or pair of objects located to her left or right (i.e., the eye gaze cue). The first two words were taught using divergent training trials and the second two words were taught using convergent training trials. In the divergent training trials, the social eye gaze and grammatical number markings led to different objects, whereas in the convergent trials the grammatical and social cues led to the same object.

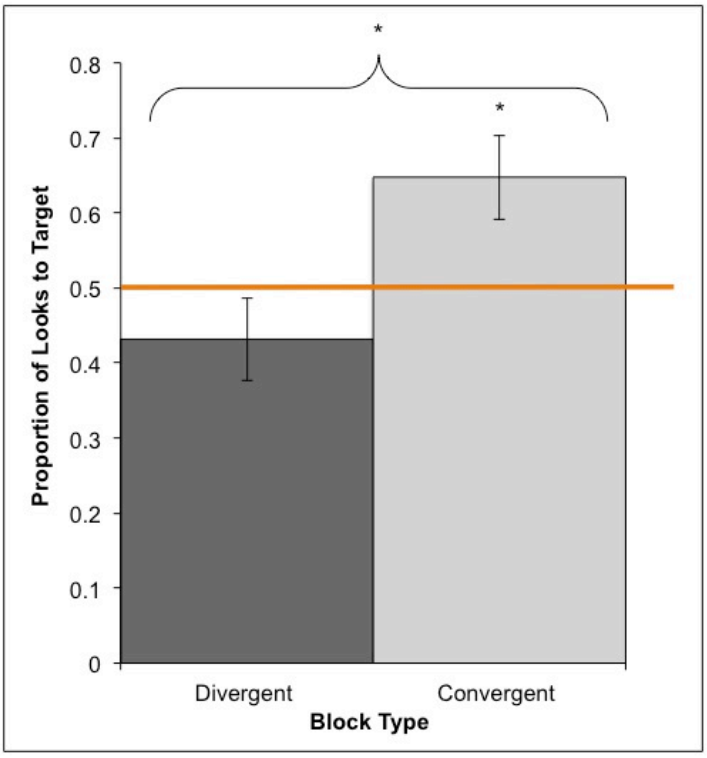


Figure 4. Mean proportion of looks to the grammatically cued target in the test phase of the divergent and convergent blocks. When novel words were trained using convergent cues, children showed robust learning of the word-object pairing at test M = .65; $t(19) = 2.63$, $p = .016$. Whereas when words were trained using divergent cues, word learning was at chance, suggesting that children did not reliably fixate on the grammatically or socially cued objects at test, M = .43; $t(19) = -1.24$, $p = .230$. Error bars represent the standard error of the mean.