J Psycholinguist Res (2017) 46:329–343
DOI 10.1007/s10936-016-9441-3

The Influence of Child-Directed Speech on Word Learning and Comprehension

Cassandra Foursha-Stevenson[1] · Taylor Schembri[2] · Elena Nicoladis[3] · Cody Eriksen[4]

Published online: 23 June 2016

Abstract This paper describes an investigation into the function of child-directed speech (CDS) across development. In the first experiment, 10–21-month-olds were presented with familiar words in CDS and trained on novel words in CDS or adult-directed speech (ADS). All children preferred the matching display for familiar words. However, only older toddlers in the CDS condition preferred the matching display for novel words. In Experiment 2, children 3–6 years of age were presented with a sentence comprehension task in CDS or ADS. Older children performed better overall than younger children with 5- and 6-year-olds performing above chance regardless of speech condition, while 3- and 4-year-olds only performed above chance when the sentences were presented in CDS. These findings provide support for the theory that CDS is most effective at the beginning of acquisition for particular constructions (e.g. vocabulary acquisition, syntactic comprehension) rather than at a particular age or for a particular task.

Keywords Child-directed speech · Word learning · Sentence comprehension

Introduction

Child-Directed Speech (CDS), also called infant-directed speech or motherese, can be defined as rhythmic speech including high-pitched, short phrases, and positive affect. This speech is commonly directed towards young children across languages such as English, Russian, Swedish, and Japanese (Kuhl et al. 1997; Andruski et al. 1999). Not only do adults use

✉ Cassandra Foursha-Stevenson
cfourshastevenson@mtroyal.ca

1 Department of Psychology, Mount Royal University, 4825 Mount Royal Gate SW, Calgary, AB T3E 6K6, Canada

2 University of Calgary, Calgary, Canada

3 University of Alberta, Edmonton, Canada

4 Yorkville University, Fredericton, Canada

CDS when speaking to children, but even 4-year-olds will adjust their speech when speaking to a younger listener (Shatz and Gelman 1973). Although the prevalence of this type of speech is well established, its function is much less clear. When characteristics of CDS are used to address the elderly, the effect can be an expression of condescension (Brown and Draper 2003). When CDS is addressed to infants, it might help their acquisition of some aspects of language, including turn-taking and word segmentation (Matychuk 2005; Snow 1977; Thiessen et al. 2005). In the present paper, we test the hypothesis that CDS might help learners at the beginning stage of acquisition for a particular aspect of linguistic development. Specifically, we examine receptive lexical acquisition and syntactic comprehension.

Infants' preference for CDS over adult-directed speech (ADS) has been well established, both anecdotally and scientifically (e.g. Fernald 1985; Cooper et al. 1997). As a result, researchers that investigate various aspects of language acquisition outside of CDS, consistently employ CDS in their paradigms to attract infant attention (e.g. Byers-Heinlein et al. 2013; Lidz et al. 2003).

Current research findings have indicated the importance of the prosodic characteristics in infants' preference for and the effectiveness of CDS. Some of the prosodic characteristics that are representative of CDS are higher pitch, increased pitch variation, increased intonational contours, increased vowel length, increased pause length, decreased speech rate, and prosodic repetition (Singh et al. 2002). Many of these prosodic patterns found in CDS are similar across cultures (Broesch and Bryant 2015). Some of the prosodic cues that infants use in attending to CDS include greater attention to frequency, but not to amplitude and duration (Fernald and Kuhl 1987). Pitch contour, in particular, has been emphasized as being important for young infants in directing attention (Cooper and Aslin 1994). Kempe et al. (2010) examined linguistic prosody in comparison to affective prosody and found that mothers used greater positive affect than non-mothers, but that increased positive affect decreased linguistic disambiguation as mothers applied postnominal pauses indiscriminately to syntactically ambiguous sentences. In parallel, infants attend to positive affect, but not to pitch (Singh et al. 2002). Singh et al. (2002) found no preference for CDS over ADS when affect was held constant, but a preference for ADS over CDS when ADS had greater positive affect. The preference for positive affect may be relevant beyond linguistic interpretation as it is important for social interaction (e.g. Golinkoff et al. 2015) and the synchronicity of the communication between the mother and infant impacts the use of CDS (Braarud and Stormark 2008).

CDS can enhance infants' sensitivity to the statistical properties of their input and they are able to make use of these properties to perform tasks such as word segmentation and speech discrimination, in particular phonemic discrimination. For example, Thiessen et al. (2005) found that infants are better at detecting word boundaries in nonsense sentences in CDS than in ADS. Kemler-Nelson et al. (1989) proposed that the prosodic characteristics of CDS enhance infants' sensitivity to clausal boundaries, as infants prefer speech with breaks at clausal boundaries to those within clauses for CDS, but not for ADS. There is evidence that the characteristics of maternal speech enhance phonemic discrimination abilities (Liu et al. 2003). This enhancement has been explained as resulting from vowel expansion causing greater sound distinction (Kuhl et al. 1997; Liu et al. 2003). Speech discrimination ability has also been linked to improved language skills at a later point (Benasich and Tallal 2002; Espy et al. 2004; Molfese 2000). A computer simulation demonstrated that vowel categories were better learned from CDS than ADS input (de Boer and Kuhl 2003). However, recent evidence has suggested that speech contrasts are actually clearer in ADS than in CDS (Martin et al. 2015). This may indicate that there are complex properties of CDS that are contributing to different aspects of language development.

CDS can also enhance children's learning of word meaning. Ma et al. (2011) found that twenty-one-month-olds learned novel words (e.g. modi for an animated object) only in the CDS condition, but twenty-one-month-olds with larger vocabularies and older children learned new words in both CDS and ADS conditions. Beyond word learning, infants have shown better long-term memory for words presented in CDS over ADS (Singh et al. 2009).

Taken together, these results suggest that CDS directed to infants can enhance their attention, segmentation, and word learning. It is not clear whether CDS helps infants because they are infants or because they are in a particular phase of their language acquisition. It is possible that CDS serves a 'use it or lose it' type of function, in which it needs to be presented early in development in order to affect acquisition. However, the nature of CDS changes with development. For example, vowel duration in CDS used by caregivers decreases between the third and fourth month of life for the infant (Englund and Behne 2006). This change may be related to changes in the infant or in the learning task (Zangl and Mills 2007). Infants' preference for age-appropriate CDS also changes. Older infants demonstrate a preference for prosodic properties (pitch and pitch variability), while younger infants demonstrate preferences for repetition and shorter utterances (McRoberts et al. 2009; Segal and Newman 2015). These changes in CDS through development may be an indication of the features of CDS that are useful for particular tasks in language development, such as lexical or syntactic acquisition.

Notably, a few studies have shown that CDS can also help adults learning a foreign language. Kempe and Brooks (2005) focused on diminutives (e.g. doggie) as one aspect of CDS. English-speaking adults demonstrated better production of Russian noun gender and generalization of novel word forms when trained with diminutives. This effect has also been demonstrated in children (Kempe et al. 2007). Golinkoff and Alioto (1995) also found that English-speaking adults were unable to learn Chinese words if presented in sentence-medial position or ADS. However, in sentence-final position or CDS, the adults were able to learn the words. These results are consistent with the possibility that CDS might enhance learning at a particular phase of learning rather than at a particular age.

For the current study, we predict that stage of acquisition determines the effectiveness of CDS on language development rather than age of acquisition. In Experiment 1, children between 10 and 21 months of age were tested on their knowledge of labels for familiar objects and their ability to learn the labels for novel objects in CDS or ADS. For example, children around the age of 18 months begin to rapidly acquire vocabulary (e.g. Bloom 1973). Therefore, CDS would be most effective in vocabulary development at this point in development when children are successfully employing information from their surroundings to increase their vocabulary at a rapid rate. In Experiment 2, children between 3 and 6 years of age were tested on their comprehension of complex sentences in CDS or ADS. Children at around 4 years of age are focusing on mastering many aspects of syntactic structure (e.g. Tomasello 2000). Therefore, children at this age would demonstrate the largest gains in this area as a result of CDS. It is predicted that CDS will be most effective for children who are beginning to acquire the construction being tested rather than CDS being most effective for a particular age.

Experiment 1

Experiment 1 investigates the influence of CDS on vocabulary comprehension and word learning in children between 10 and 21 months of age. It is predicted that CDS will be more effective for older infants in the word learning task, as these children are rapidly acquiring vocabulary.

Method

Participants

Sixty-two monolingual, English-speaking children with no reported speech or language problems participated; 46.8 % were female. Monolingual is defined based on a parental report of systematic exposure to only English (e.g. home, school). Thirty-one 13-month-old children (M = 13;6, range: 10;2 to 15;10) and 31, 19-month-old children (M = 19;6, range: 16;3 to 21;10) participated. Eleven additional children were excluded, two for failure to watch the video, and nine for experimenter or recording error. Participants were recruited from local daycares.

Materials and Design

Each child was shown a presentation using the Intermodal Preferential Looking Paradigm (Golinkoff et al. 2013). The pictures and audio stimuli were presented with Microsoft PowerPoint on a Macintosh laptop. iMovie recorded the children as they watched each of the videos. The presentation consisted of three blocks: the Familiar Word Block, the Novel Word Training Block, and the Novel Word Test Block. The Familiar Word Block consisted of four trials testing knowledge of labels for familiar objects (**cat** vs. bottle, dog vs. **spoon**, cat vs. **car**, **dog** vs. bottle). These test trials were accompanied by the phrase, "*which one is the x, where is the x". Cat, spoon, car,* and*dog* were substituted for *x*.All familiar trials were presented in CDS. Each trial throughout the blocks was preceded by a video of a noisy toy in the centre of the screen to ensure centered fixation.

The Novel Word Training Block consisted of four training trials for labels for novel objects (whisk, lockbox, keychain tag, and stop watch, see Appendix 1). These trials were accompanied by a labelling phrase such as, "*look it's a Dakar, it's a Dakar, see a Dakar, wow a Dakar*". The Novel Word Test Block consisted of four trials testing their knowledge of these novel words (**lockbox** vs. whisk, tag vs. **stop watch**, lockbox vs. **whisk**, **tag** vs. stop watch). The novel test trials were accompanied by the phrase, "*which one is the dakar, where is the dakar*". The matching display followed an ABBA pattern.

Half of the children were randomly assigned to the CDS condition and half were randomly assigned to the ADS condition for the novel word blocks (Training and Test). The video stimulus and object-name associations were identical in both conditions with only the difference being whether the test was presented in CDS or ADS. All audio stimuli were recorded by a female, native-speaker of Canadian English. In the CDS condition all phrases accompanying the novel photographs were spoken in a high-pitched, rhythmic voice. The phrases in the ADS condition were presented in a fairly monotone, typically pitched voice. Ten adult, native English-speakers were presented with the four matching CDS and ADS auditory training trials. The adults identified the CDS trials with 100 % accuracy. All ten adults also reported that the appropriate trials corresponded with those labels (CDS and ADS).

Procedure

After obtaining permission from the guardians, participants were brought to a quiet area of the daycare to prevent distractions and the exposure of other children to the stimuli. The participants were then asked if they would like to watch a movie that asks some questions. The children were then presented with the displays on a laptop with external speakers as

described above. Some of the younger children sat on a caretakers' lap during the procedure. These caretakers were asked after the study if they could identify the names associated with the novel objects and no caretakers were able to. It is likely that the caregivers paid little attention to the labels since they were aware that they were contrived.

Coding and Analysis

The duration of looking time to the left or right was coded off-line, frame-by-frame, by a coder who was unaware of the locations of the matching displays. A second, independent observer coded 41 of the participants; the coders agreed on 93 % of the video frames.

The average proportion of looking time to the matching display in comparison to the non-matching display was calculated as an average across the familiar word trials. The average proportion of looking time to the matching display in comparison to the non-matching display was calculated as an average across the novel word trials, as well. These values were subjected to a one-sample *t* test with chance as .5.

Results

Familiar Words

The proportion of looking time to the matching display was significantly above chance across age groups for the familiar words, ($t(61) = 2.93$, $p = .005$, $M = .54$, $SE = .015$, 13 months: $M = .54$, $SE = .019$, 19 months: $M = .54$, $SE = .024$).

Novel Words

The 13-month-olds' proportion of looking time to the matching display was at chance for participants in the ADS and in the CDS conditions, (ADS: $t(15) = 1.38$, $p = .19$, $M = .57$, $SE = .052$, CDS: $t(13) = -1.57$, $p = .14$, $M = .45$, $SE = .027$). The 19-month-olds' proportion of looking time to the matching display was also at chance for the ADS condition ($t(13) = .36$, $p = .72$, $M = .51$, $SE = .032$). However, in the CDS condition, looking time was above chance for the 19-month-olds ($t(17) = 2.33$, $p = .03$, $M = .56$, $SE = .027$) (see Fig. 1).

The data were also subjected to a (2) Age Group (13 months vs. 19 months) x (2) Speech Condition (ADS vs. CDS) univariate analysis of variance (ANOVA). Preliminary analyses revealed no effect of gender so this factor was removed. The analysis revealed an age group by speech condition interaction, $F(1,58) = 5.17$, $p = .03$, $\eta^2 = .08$; with the older children producing a greater proportion of looking times to the matching over the non-matching display in the CDS group, but not in the ADS group. The younger children produced the reverse pattern, but this was only marginally significant, $t(29) = 1.92$, $p = .07$ and as mentioned above, neither or these scores are above chance (see mean values above) (see Fig. 1).

Discussion

The findings from Experiment 1 indicate that CDS can be effective in language processing for young children. The 13- and 19-month-olds are able to understand familiar words that are presented in CDS. More importantly, 19-month-olds were able to use CDS, but not ADS to learn novel words, while 13-month-olds were not able to use CDS or ADS effectively in this situation. These findings corroborate the findings of Ma et al. (2011), in which 21-month-olds were able to learn new words in CDS, but not in ADS. However, Experiment 1 provides

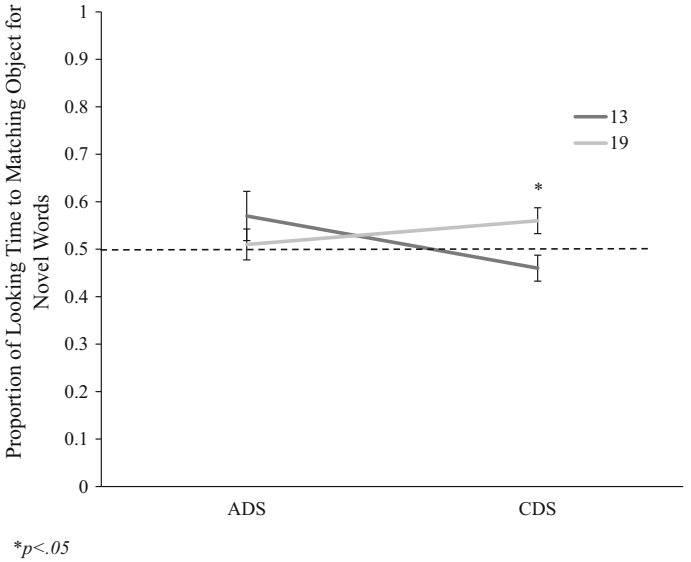


Fig. 1 Mean proportion of looking time to the matching display (+SE) by age as a function of speech type for novel words. $*p < .05$. Please note that the p values correspond to the comparison against chance

evidence for the utility of CDS at an even younger age. It is possible that the CDS being used in this type of word learning task may be particularly effective for this type of learning. As the task changes, the quality and emphasis of the CDS may also change.

These findings provide some support for the theory that the language learning task may be driving the functionality of CDS rather than age. In Experiment 1, our 19-month-old group represents a stage in which vocabulary is rapidly being acquired. It is possible that children at this stage are becoming competent word learners and are using any tool available to them to map labels to new referents and CDS may be one of these tools. Alternatively, our 13-month-olds are at the very beginning of word learning and the task may be too challenging even with the assistance of CDS. Correspondingly, CDS could be useful to 13-month-olds with a simpler language learning task.

Experiment 1 alone does not confirm this hypothesis because it is still possible that 19 months is the prime age for the use of CDS. Therefore, it needs to be tested at different ages and with different prominent learning tasks.

Experiment 2

Experiment 2 investigates CDS and comprehension of complex sentences. Although the use of and preferences for CDS have been investigated fairly extensively in younger children, little research has been performed on CDS in older children. This experiment evaluates the effectiveness of CDS in language processing tasks that are appropriate for older children.

Although some of the most dramatic and noticeable changes in language development occur early in acquisition, many important constructions are acquired in early childhood. For example, children in early childhood begin to master syntactic comprehension including the use of word order and verbal morphology.

Chan et al. (2010) examined children's understanding of canonical subject-verb-object (SVO) word order through act out and looking time methods (Intermodal Preferential Looking). Two-year-olds demonstrated understanding of SVO word order with familiar words when tested with the IPL task, but did not succeed at comprehending sentences with new words, while older children (3;5 and 2;9) demonstrated understanding of sentences with familiar and novel words in both tasks. The authors claim that this finding supports the hypothesis that early understandings of SVO are fragile, while stronger syntactic understanding develops later in development. In addition, children in the early childhood years, particularly beyond 3 years of age, demonstrate their syntactic understanding through priming and generalization tasks (e.g. Savage et al. 2003; Huttenlocher et al. 2004).

Experiment 2 specifically examines comprehension of transitive-like and intransitive-like sentences through the use of familiar verbs and concurrent video scenes. Yuan and Fisher (2009) found that children, just over 2 years of age, who have been trained in transitive dialogue looked at the two participant events longer than those trained in the intransitive condition, indicating that the children in the transitive dialogue condition were able to infer from the dialogue presentation that two individuals were required for a transitive statement.

Experiment 2 examines if CDS plays a role in the interpretation of these types of sentences. According to the vast literature on this type of construction, it is predicted that older children will perform well on these sentences and that CDS will enhance comprehension for younger children, who are beginning to become proficient with word order and verbal morphology.

Method

Participants

Eighty-eight monolingual, English-speaking children with no reported speech or language problems participated. Monolingual is defined based on a parental report of systematic exposure to only English (e.g. home, school). The sample was 61.4 % female. 22 3-year-old children (M = 43.0, range: 38.0 to 47.8), 22 4-year-old children (M = 53.4, range: 48.5 to 59.2), 22 5-year-old children (M = 66.4, range: 60.7 to 71.2), and 22 6-year-old children (M = 76.2, range: 72.7 to 83.3) participated. One child was excluded because of a computer error, but no data was collected. Participants were recruited from local daycares, preschools, day camps, and organized sports groups.

Materials

The materials for the study included self-created video clips with paired self-created audio stimuli. The actions for the videos were created using two puppets; one was a brown monkey and the other a white rabbit. The actions were then filmed with a video camera in front of a solid green background (see Appendix 2). The video clips and paired audio stimulus followed a specific script (see Appendix 3). The video and audio stimuli were presented with Microsoft PowerPoint on a Macintosh laptop. iMovie recorded the children as they watched each of the videos.

Design (see Appendix 3)

Participants were randomly assigned to either a CDS or an ADS condition. The stimuli were either presented in CDS or in ADS. All audio stimuli were recorded by a

female, native-speaker of Canadian English. In the CDS condition all phrases accompanying the novel videos were spoken in a high-pitched, rhythmic voice. The phrases in the ADS condition were presented in a fairly monotone, typically pitched voice. Ten adult, native English-speakers were presented with the six matching CDS and ADS auditory trials. The adults identified the CDS trials with 100 % accuracy. All ten adults also reported that the appropriate trials corresponded with those labels (CDS and ADS).

In the familiarization trials, children were introduced to familiar verbs (e.g. jumping). During the next set of trials, the children were presented with sentences containing these familiar verbs. The children were asked to point at one of two videos (transitive or intransitive), which matched the sentence presented. The experimenters responded to each point by saying "good job" or "thank-you", regardless of if the child made the correct selection. If a child failed to spontaneously point they were encouraged to choose which ever one they thought was right. In addition, if a child's point was unclear they were asked to show the experimenter again (this occurred more often with younger children). All responses or encouragement were delivered in CDS. The trials alternated between transitive- and intransitive-type sentences and the matching display followed an ABBA pattern. The points were documented by two independent raters from a video of the child (not including the test video).

Procedure

All children were tested in a quiet room at their preschool/daycare or in their home. Each child was individually asked if they wanted to participate in the study by being invited to watch some videos and answer a few questions. Once assent was obtained, the child was seated in front of a laptop with external speakers that displayed the video and audio clips while recording the child's performance. Participants responded to the questions posed in the video and indicated there selection by pointing to the side of the screen that displayed the video that they believed matched the audio recording.

Results

A one-sample *t* test was performed on the accuracy data with .5 as the measure of chance.

ADS Condition

Only the 5- and 6-year-olds performed above chance in the ADS condition (3 years: $t(12) = .46$, $p = .66$, $M = .53$, $SE = .06$, 4 years: $t(10) = 1.17$, $p = .27$, $M = .58$, $SE = .06$, 5 years: $t(11) = 3.63$, $p = .004$, $M = .69$, $SE = .05$, 6 years: $t(10) = 6.71$, $p < .001$, $M = .86$, $SE = .05$) (see Fig. 2).

CDS Condition

All children performed above chance in the CDS condition (3 years: $t(8) = 2.29$, $p = .05$, $M = .69$, $SE = .08$, 4 years: $t(10) = 3.55$, $p = .005$, $M = .71$, $SE = .06$, 5 years: $t(9) = 5.46$, $p < .001$, $M = .82$, $SE = .06$, 6 years: $t(10) = 8.48$, $p < .001$, $M = .89$, $SE = .05$) (see Fig. 2).

The accuracy data was also subjected to a (4) Age Group (3 years vs. 4 years vs. 5 years vs. 6 years) x (2) Speech Condition (ADS vs. CDS) univariate analysis of variance.

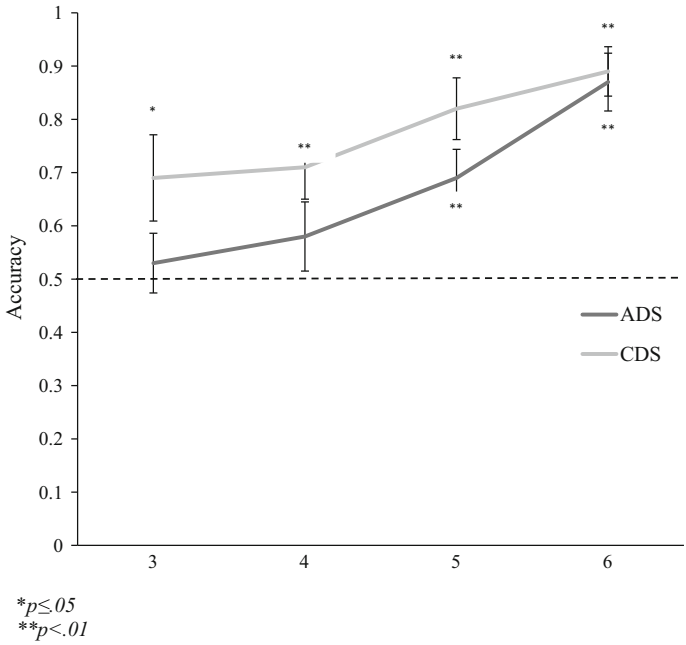


Fig. 2 Mean accuracy (+SE) by age as a function of speech type. $^{**}p < .01$. Please note that the p values correspond to the comparison against chance

Preliminary analysis revealed no effect of gender so this factor was removed. The analysis revealed a main effect of age group, $F(3,87) = 8.61$, $p < .001$, $\eta^2 = .24$ with performance improving with age (3 years: $M = .61$, $SE = .042$, 4 years: $M = .64$, $SE = .042$, 5 years: $M = .76$, $SE = .042$, 6 years: $M = .88$, $SE = .042$). A main effect of speech condition was also revealed, $F(1,87) = 7.15$, $p = .009$, $\eta^2 = .08$, with children in the CDS condition performing better than those in the ADS condition (CDS: $M = .76$, $SE = .029$, ADS: $M = .66$, $SE = .027$).

Discussion

As predicted, the older children in Experiment 2 performed better than the younger children. Also, as predicted, children performed better overall on the sentences presented in CDS. This result could be a consequence of increased attention in this condition, as infants have been shown to prefer CDS (e.g. Fernald 1985). Alternatively, and possibly more interesting, features of CDS are enhancing children's ability to comprehend the speech.

Although the analysis of variance did not reveal any interaction with age, strikingly, 5- and 6-year-olds performed above chance on the sentences regardless of speech condition. These findings support the idea that the effectiveness of CDS may be related to task difficulty and language processing stage rather than age. As children become more competent in their comprehension of sentences, they may rely less on the features of CDS to assist in processing. Three- and four-year-olds are just beginning to master these types of complex sentences (e.g. Wagner et al. 2009), while five- and six-year-olds have far more experience, in which case, CDS does not have the same facilitating effect.

General Discussion

Taken together, Experiments 1 and 2 provide support for the theory that CDS functions most effectively based on task and stage of development rather than on age alone. There does not appear to be a set age in which CDS, in general, is most effective, but rather CDS functions well for children when they are focusing on a particular aspect of language acquisition. As such, CDS no longer enhances children's language learning and processing once they have already mastered a particular construction. This interpretation is consistent with findings from adults, for whom CDS can facilitate some aspects of second-language learning (e.g. Golinkoff and Alioto 1995).

It would be useful to examine independent measures of children's language ability to establish exactly which constructions they are in the process of acquiring to determine the effect of CDS on acquisition more specifically. It would also be useful to examine other aspects of language acquisition at different ages to test this hypothesis. Particularly at younger ages, in which infants are beginning to master the sounds of their language or at older ages, in which children are concentrating on more complex aspects of grammar both in comprehension and production. In addition, the nature of CDS at different points in development may change as has been shown for infants (e.g. Englund and Behne 2006), but this should be expanded for older children. For example, does the nature of CDS need to change in order to learn new language tasks such as verbal morphology? How are particular characteristics of CDS (e.g. pitch, duration, affect) related to the particular language acquisition task? Lastly, future research studies could evaluate exactly what features of CDS are facilitating language acquisition in these types of circumstances (e.g. pitch, duration, etc.).

These findings also highlight some potential applied implications. CDS may be effective in aiding language learning when used to target constructions that learners have not yet mastered. However, when used in addressing people who have already mastered these constructions, CDS could convey a condescending attitude toward the interlocutor (Brown and Draper 2003). Further studies along similar lines can help caregivers establish exactly how and when CDS can enhance language learning.

Funding This study was funded by a Mount Royal University Internal Research Grant.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

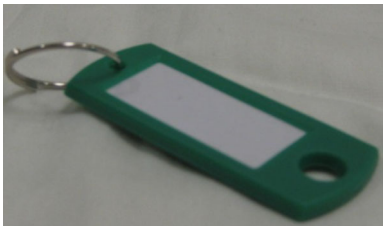
Appendix 1

Kalty

Dakar

Blicket

Bimpko



Appendix 2

Intransitive

Transitive

Appendix 3

Familiarization test script

Screen A	Verbal Stimulus	Screen B
Monkey tickles bunny and vice versa	"See tickling? Can you find where the Monkey is tickling the bunny?"	Monkey tickles self, bunny tickles self
Monkey makes bunny nod and vice versa	"Ohh look nods! Can you find where the monkey nods? Can you find where the bunny nods?"	**Monkey nods, Bunny nods**
Monkey jumps, Bunny jumps	"Ohh wow jumping! Can you find where the Bunny is jumping over the monkey?"	**Bunny jumps over Monkey and vice versa**
Bunny tickles self, Monkey tickles self	"Ohh look tickles! Can you find where the Bunny tickles herself? Can you find where the Monkey tickles himself?"	Bunny tickles Monkey
Bunny nods, Monkey nods	"See nodding! Can you find where the Monkey is making the Bunny nod?"	**Bunny makes the Monkey nod and vice versa**
Monkey jumps, Bunny jumps	"Ohh wow jumps! Can you find where the monkey jumps? Can you find where the bunny jumps?"	Bunny jumps over Monkey and vice versa

Bold indicates the correct answer

References

Andruski, J. E., Kuhl, P. K., & Hayashi, A. (1999). Point vowels in Japanese mothers' speech to infants and adults. *The Journal of the Acoustical Society of America*, *105*(2), 1095–1096.

Benasich, A. A., & Tallal, P. (2002). Infant discrimination of rapid auditory cues predicts later language impairment. *Behavioural Brain Research*, *136*, 31–49.

Bloom, L. (1973). *One word at a time*. The Hague: Mouton.

Braarud, H. C., & Stormark, K. M. (2008). Prosodic modification and vocal adjustments in mother's speech during face-to-face interaction with their two- to four-month-old infants: A double video study. *Social Development*, *17*(4), 1074–1084.

Broesch, T. L., & Bryant, G. A. (2015). Prosody in infant-directed speech is similar across western and traditional cultures. *Journal of Cognition and Development*, *16*(1), 31–43.

Brown, A., & Draper, P. (2003). Accommodative speech and terms of endearment: Elements of a language mode often experienced by older adults. *Journal of Advanced Nursing*, *41*, 15–21.

Byers-Heinlein, K., Fennell, C. T., & Werker, J. F. (2013). The development of associative learning in monolingual and bilingual infants. *Bilingualism: Language and Cognition*, *16*(1), 198–205.

Chan, A., Meints, K., Lieven, E., & Tomasello, M. (2010). Young children's comprehension of English SVO word order revisited: Testing the same children in act-out and intermodal preferential looking tasks. *Cognitive Development*, *25*, 30–45.

Cooper, R. P., Abraham, J., Berman, S., & Staska, M. (1997). The development of infants' preference for motherese. *Infant Behavior and Development*, *20*(4), 477–488.

Cooper, R. P., & Aslin, R. (1994). Developmental differences in infant attention to the spectral properties of infant-directed speech. *Child Development*, *65*, 1663–1677.

de Boer, B., & Kuhl, P. K. (2003). Investigating the role of infant-directed speech with a computer model. *Acoustics Research Letters Online*, *4*, 129–134.

Englund, K. (2006). Changes in infant directed speech in the first six months. *Infant and Child Development*, *15*(2), 139–160.

Espy, K. A., Molfese, D. L., & Molfese, V. J. (2004). Development of auditory event-related potentials in young children and relations to word-level reading abilities at age 8 years. *Annals of Dyslexia*, *54*, 9–38.

Fernald, A. (1985). Four-month-old infants prefer to listen to motherese. *Infant Behavior and Development*, *8*(2), 181–195.

Fernald, A., & Kuhl, P. (1987). Acoustic determinants of infant preference for motherese speech. *Infant Behaviour and Development*, *10*, 279–293.
Golinkoff, R. M., & Alioto, A. (1995). Infant-directed speech facilitates lexical learning in adults hearing Chinese: Implications for language acquisition. *Journal of Child Language*, *22*, 703–726.
Golinkoff, R. M., Ma, W., Song, L., & Hirsh-Pasek, K. (2013). Twenty five years using the intermodal preferential looking paradigm to study language acquisition: What have we learned? *Perspectives on Psychological Science*, *8*(3), 316–339.
Golinkoff, R. M., Can, D. D., Soderstrom, M., & Hirsh-Pasek, K. (2015). (Baby) talk to me: The social context of infant-directed speech and its effects on early language acquisition. *Current Directions in Psychological Science*, *24*(5), 339–344.
Huttenlocher, J., Vasilyeva, M., & Shimpi, P. (2004). Syntactic priming in young children. *Journal of Memory and Language*, *50*, 182–195.
Kemler Nelson, D. G., & Smith, J. D. (1989). Analytic and holistic processing in reflection-impulsivity and cognitive development. In T. Globerson & T. Zelniker (Eds.), *Cognitive style and cognitive development* (pp. 116–140). Norwood, NJ: Ablex.
Kempe, V., & Brooks, P. J. (2005). The role of diminutives in the acquisition of Russian gender: Can elements of child-directed speech aid in learning morphology? *Language Learning*, *55*(S1), 139–176.
Kempe, V., Brooks, P. J., Mironova, N., Pershukova, A., & Fedorova, O. (2007). Playing with word endings: Morphological variation in the learning of Russian noun infections. *British Journal of Developmental Psychology*, *25*(1), 55–77.
Kempe, V., Schaeffler, S., & Thoresen, J. C. (2010). Prosodic disambiguation in child-directed speech. *Journal of Memory and Language*, *62*, 204–225.
Kuhl, P. K., Andruski, J. E., Chistovich, I. A., Chistovich, L. A., Kozhevnikova, E. V., Ryskina, V. L., et al. (1997). Cross-language analysis of phonetic units in language addressed to infants. *Science*, *277*(5326), 684–686.
Lidz, J., Waxman, S., & Freedman, J. (2003). What infants know about syntax, but couldn't have leaned: Experimental evidence for syntactic structure at 18 months. *Cognition*, *89*, B65–B73.
Liu, H., Kuhl, P., & Tsao, F. (2003). An association between mothers' speech clarity and infants' speech discrimination skills. *Developmental Science*, *6*(3), F1–F10.
Ma, W., Golinkoff, R. M., Houston, D. M., & Hirsh-Pasek, K. (2011). Word learning in infant-and adult-directed speech. *Language Learning and Development*, *7*(3), 185–201.
Martin, A., Schatz, T., Versteegh, M., Miyazawa, K., Mazuka, R., Dupoux, E., et al. (2015). Mothers speak less clearly to infants than to adults: A comprehensive test of the hyperarticulation hypothesis. *Psychological Science*, *26*(3), 341–347.
Matychuk, P. (2005). The role of child-directed speech in language acquisition: A case study. *Language Sciences*, *27*(3), 301–379.
McRoberts, G. W., McDonough, C., & Lakusta, L. (2009). The role of verbal repetition in the development of infant speech preferences from 4 to 14 months of age. *Infancy*, *14*(2), 162–194.
Molfese, D. L. (2000). Predicting dyslexia at 8 years of age using neonatal brain responses. *Brain and Language*, *72*(3), 238–245.
Savage, C., Lieven, E., Theakston, A., & Tomasello, M. (2003). Testing the abstractness of children's linguistic representations: Lexical and structural priming of syntactic constructions in young children. *Developmental Science*, *6*, 557–567.
Segal, J., & Newman, R. S. (2015). Infant preferences for structural and prosodic properties of infant-directed speech in the second year of life. *Infancy*, *20*(3), 339–351.
Shatz, M., & Gelman, R. (1973). The development of communication skills: Modifications in the speech of young children as a function of listener. *Monographs of the Society for Research in Child Development*, *38*(5), 1–38.
Singh, L., Morgan, J. L., & Best, C. T. (2002). Infants' listening preferences: Baby talk or happy talk? *Infancy*, *3*(3), 365–394.
Singh, L., Nestor, S., Parikh, C., & Yull, A. (2009). Influences of infant-directed speech on early word recognition. *Infancy*, *14*(6), 654–666.
Snow, C. E. (1977). Mothers' speech research: From input to interaction. In C. Snow & C. Ferguson (Eds.), *Talking to children: Language input and acquisition* (pp. 31–49). Cambridge: Cambridge University Press.
Thiessen, E. D., Hill, E. A., & Saffran, J. R. (2005). Infant-directed speech facilitates word segmentation. *Infancy*, *7*(1), 53–71.
Tomasello, M. (2000). Do young children have adult syntactic competence? *Cognition*, *74*(3), 209–253.
Wagner, L., Swensen, L. D., & Naigles, L. R. (2009). Children's early productivity with verbal morphology. *Cognitive Development*, *24*, 223–239.

Yuan, S., & Fisher, C. (2009). Really? She blicked the baby? Two-year-olds learn combinatorial facts about verbs by listening. *Psychological Science*, *20*(5), 619–626.

Zangl, R., & Mills, D. L. (2007). Increased brain activity to infant-directed speech in 6-and 13-month-old infants. *Infancy*, *11*(1), 31–62.