THE OFFICIAL JOURNAL OF THE
INTERNATIONAL CONGRESS
OF INFANT STUDIES

Infancy, 1–14, 2016

ISSN: 1525-0008 print / 1532-7078 online
DOI: 10.1111/infa.12145

WILEY Blackwell

Home Environment, But Not Socioeconomic Status, is Linked to Differences in Early Phonetic Perception Ability

Samantha A. Melvin
Teachers College
Columbia University

Natalie H. Brito
Columbia University

Luke J. Mack
Sanford Health

Laura E. Engelhardt
University of Texas

William P. Fifer
Columbia University

Amy J. Elliott
Sanford Health

Kimberly G. Noble
Teachers College
Columbia University

Infants perceptually tune to the phonemes of their native languages in the first year of life, thereby losing the ability to discriminate non-native phonemes. Infants who perceptually tune earlier have been shown to develop stronger language skills later in childhood. We hypothesized that socioeconomic disparities, which have been associated with differences in the quality and quantity of language in the home, would contribute to individual differences in phonetic discrimination. Seventy-five infants were assessed on measures of phonetic discrimination at 9 months, on the quality of the home environment at 15 months, and on language abilities at both ages. Phonetic discrimination did not vary according to

Correspondence should be sent to Kimberly G. Noble, Teachers College, Columbia University, 525 W 120th St., Box 199, New York, NY 10027. E-mail: kgn2106@tc.columbia.edu

socioeconomic status (SES), but was significantly associated with the quality of the home environment. This association persisted when controlling for 9-month expressive language abilities, rendering it less likely that infants with better expressive language skills were simply engendering higher quality home interactions. This suggests that infants from linguistically richer home environments may be more tuned to their native language and therefore less able to discriminate non-native contrasts at 9 months relative to infants whose home environments are less responsive. These findings indicate that home language environments may be more critical than SES in contributing to early language perception, with possible implications for language development more broadly.

Perceptual tuning is the process by which infants, who can initially perceive phonemes of any language, begin to purely discriminate among phonemes in languages to which they have been exposed. This relatively early process in language acquisition occurs between 6 and 12 months of age (Werker & Tees, 1984), and studies have found that the timing of this shift predicts later language ability, such that infants who undergo this process at an earlier age ultimately develop stronger language skills (for a recent review, see Cristia, Seidl, Junge, Soderstrom, & Hagoort, 2014). Individual differences in the timing of perceptual tuning, as indicated by phonetic discrimination skill, can be seen throughout the latter half of the first year, and particularly at around 9 months of age (Yeung & Werker, 2009). However, the specific factors that contribute to individual differences in this skill are unclear.

Kuhl (2007) has suggested that this process may be contingent upon social interaction. For example, these researchers have reported that English-exposed infants who were exposed to novel linguistic input (Mandarin Chinese) during live interactions learned and retained the ability to discriminate among novel phonemes more efficiently than did those who were exposed to either English alone or to Mandarin via video or audio-only exposure. Thus, phonetic discrimination may be reliant on social interaction to some extent, although the precise mechanisms by which social and/or environmental contexts account for differences in this perceptual process have yet to be explained.

A large literature documents the existence of a socioeconomic status (SES) achievement gap, whereby socioeconomic disparities in cognitive skills emerge in infancy and increase throughout development (Brooks-Gunn, Rouse, & McLanahan, 2007). The SES gap in language skills in particular has been well documented (Fernald, Marchman, & Weisleder, 2013; Hart & Risley, 1995; Hoff, 2003a; Noble, McCandliss, & Farah, 2007; Noble et al., 2015; Rowe & Goldin-Meadow, 2009). Children from higher SES families are likely to hear a greater number of words, as well as more complex conversations, relative to their less advantaged peers (Hart & Risley, 1992; see Hoff, 2006 for a review). Further, children from higher SES backgrounds are more likely to be exposed to cognitively stimulating learning materials (Yeung, Linver, & Brooks-Gunn, 2002) and to experience greater warmth and nurturance from parents and caregivers (Brooks-Gunn & Markman, 2005). These differences in quantity and quality of language, as well as caregiver responsiveness, may account for socioeconomic differences in early childhood language skill (Hoff, 2003b; Weisleder & Fernald, 2013), as well as a host of other cognitive skills (Bornstein & Tamis-Lemonda, 1997; Tamis-LeMonda, Bornstein, & Baumwell, 2001), and may contribute to later academic achievement more broadly (Duncan et al., 2007).

One possibility is that socioeconomic disparities in language experience that begin early in infancy may account for the individual differences seen in foundational language skills such as phonetic discrimination. One study to date has reported on the relation between parental SES and phonetic discrimination ability (Tsao, Liu, & Kuhl, 2004). These authors found no significant associations between parental education and infant phonetic discrimination ability, although their study was limited to a relatively middle-class sample. Importantly, associations between home environmental factors and language development may be stronger and more consistent than those between SES and such outcomes (Bryant, Bradley, Maclean, & Crossland, 1989), and thus, differences in the home language environment, rather than SES per se, may contribute to differences in phonetic discrimination.

In this study, we tested three hypotheses. First, we hypothesized that SES would account for individual differences in phonetic discrimination ability at 9 months, as previous work has demonstrated SES disparities in a variety of early language skills. Second, because of known associations between SES and parenting practices, as well as associations between social interaction and phonetic discrimination, we further hypothesized that these socioeconomic disparities in phonetic discrimination would be mediated by differences in the home environment, such that SES associations with phonetic discrimination would be attenuated when accounting for differences in the quality of the home environment. Finally, a robust body of work has suggested that infants who tune to the phonemes of their native language earlier ultimately develop larger vocabularies and better language abilities (Cristia et al., 2014). One possible mechanism explaining this phenomenon is that infants' perception and identification of native phonemes is necessary for the later ability to produce and understand words using those sounds. Accordingly, our third hypothesis was that individual differences in phonetic discrimination would predict language ability at 15 months.

The overarching goal of this investigation is to better understand the ways in which early experience may contribute to early-emerging language skills. This study may serve as a step toward gaining a better understanding of these links, which could ultimately inform policy and intervention efforts, particularly those targeting language practices in lower income families with young children.

METHOD

Participants

Seventy-five full-term infants (27 male) were enrolled at 9 months of age (M = 9.43, SD = 0.46) for this study. All families reported that English was the only language spoken in the home. Participants in this study were recruited from a cohort of participants in a large, longitudinal study investigating the relation between prenatal exposures and birth outcomes (Dukes et al., 2014).[1] This study took place at a single participating clinic site in Sioux Falls, South Dakota. Recruitment in this study consisted of contacting all families enrolled in the larger study as their children

[1]Approximately 7 in 10 women receiving prenatal care at the clinic were randomly approached for recruitment to the larger study. Women were excluded from the study if they carried three or more fetuses in pregnancy, planned abortion, and planned to move out of the area before delivery were unable to provide consent, or if their healthcare provider advised against participation.

approached their 9-month birthdays, until 90 participants were enrolled. Participants were excluded on the bases of multiple gestation pregnancy, birth before 37 weeks gestation, major neurological or developmental deficits, or maternal age under 18 years. Children in both the larger study and this study were selected without regard to prenatal exposures. This study was not powered to detect effects of these exposures; further, at the time of this writing, investigators remained blind to these exposures, as data collection in the larger study was ongoing.

Families participated in two laboratory visits: one at the time of enrollment and another at 15 months. During these laboratory visits, families participated in a battery of neurocognitive tasks. Families also received a home visit when infants were 15 months of age (M = 14.83, SD = 0.53), during which the HOME Inventory and SES questionnaire were administered. Among the 90 participants enrolled at 9 months, 86 (95.6%) returned for the second laboratory visit at 15 months (M = 15.35, SD = 0.46), and 88 (97.8%) completed a home visit at 15 months. Of the 88 who completed the home visit, an additional 13 participants were not included in analyses due to incomplete scores on the phonetic discrimination task (n = 12) or HOME Inventory (n = 1), yielding a final N of 75.

All parents provided written informed consent for their family's participation in this study. Research procedures were approved by the Columbia University Medical Center IRB and the Sanford Health IRB.

Measures

Phonetic discrimination

This measure assesses the degree to which young children can discriminate between two perceptually similar sounds, retroflex alveolar stop [ɖ] and dental alveolar stop [d̪], two phonemes that are common in the Hindi language but that are indistinguishable to native English speakers. Although these phonemes are perceptually indistinguishable to an adult native English speaker, monolingual English-exposed infants continue to be able to distinguish between the sounds until they complete the phonetic perceptual tuning process between 6 and 12 months, as indicated by previous looking time studies (Werker & Tees, 1984).

The task was administered at 9 months following the habituation–dishabituation protocol reported in previous studies of infant language learning (Best, McRoberts, LaFleur, & Silver-Isenstadt, 1995; Narayan, Werker, & Beddor, 2010; Shi & Werker, 2001; Werker & Polka, 1993; Werker & Yeung, 2005). Testing took place in a quiet, dimly lit room. The infant was seated on his or her parent's lap 40 in. away from a monitor, and two speakers were placed on each side of the monitor. The monitor and speakers sat on a table, approximately at the infant's eye level, and were connected to a Macbook Pro, which remained hidden from the participant by a curtain. A webcam was situated immediately below the center of the monitor and allowed the experimenter to watch a real-time video of the infant's gazes. To reduce the possibility of parents influencing their infants' reactions to the stimuli, parents wore sound-blocking headphones and closed their eyes during the presentation. If infants turned away from the screen, parents were asked to reposition them to face the screen. Stimuli were presented using Habit 1.0 (Cohen, Atkinson, & Chaput, 2004). As the stimuli were displayed, the experimenter watched the infant via webcam and coded in real time whether the infant was looking at the monitor or not.

Infants first watched a video clip of a blue flower to draw their attention to the monitor. At pre-test and post-test, a clip of a colorful spinning waterwheel was played along with short tokens of a randomly rising and falling tone to establish general interest in the task. All trials were preceded by the presentation of the blue flower designed to draw the infant's attention back to the presentation. The experimenter initiated each trial after verifying that the infant was attending to the display. Habituation trials consisted of repeated 14 sec presentations of [ɖ] and a red and black checkerboard. Looking time was averaged across every three habituation trials. Infants were considered to have habituated to [ɖ] when their average looking time for the most recent set of three trials had dropped to 65% of their average looking time for the first set of three trials. The minimum number of trials presented was 6, and the maximum was 24. Once infants had successfully habituated, they were presented with the original, habituated [ɖ] for an additional 14 sec ("same" test trial), after which they were presented with the novel [d̪] for 14 sec ("switch" test trial). Finally, the monitor displayed the spinning waterwheel to reorient the infant to the screen and signify the end of the task. Infants were excluded if their looking times at post-test were significantly shorter than those at pretest. The entire task duration was between 5 and 10 min, depending on the length of time it took for the infant to habituate.

Coders subsequently reviewed the webcam videos frame-by-frame to confirm the looking times recorded in Habit. At every 200-msec interval, the coder determined whether the infant was attending to the monitor or not. To investigate individual differences across infants, we report the ratio of looking time during "switch" to "same" trials, computed by dividing the total looking time, in seconds, on "switch" trials by the total looking time on "same" trials. In subsequent analyses, ratios above 1 indicate greater looking time for the novel sound relative to the sound to which the infant was habituated, here suggesting that the infant was still able to discriminate between the phonemes. Reliability checks were run on 100% of the test trial scores and 20% of the relevant habituation trial scores, with >95% inter-rater reliability achieved.

Receptive and expressive language

The *Preschool Language Scale-4* (PLS) is a standardized language assessment, normed for children from birth to age 6 (Zimmerman & Castilleja, 2005). This measure assesses children's receptive and expressive English language development through a series of interactive items designed to elicit desired language skills. The Auditory Comprehension subscale (PLS-A) measures receptive language skills by examining a child's ability to comprehend and respond to language. The Expressive Communication subscale (PLS-E) measures expressive language skills by assessing a child's ability to produce verbal language and respond to questions. The PLS-4 has test–retest coefficients between .82 and .95 for subscale scores, .90 to .97 for total score; internal consistency coefficients range from .66 to .96, with most above .81. During both the 9- and 15-month laboratory visits, children sat with their parent and the experimenter at a small table or on the floor of a well-lit room. Parents were instructed not to reply or help their child unless specifically instructed to do so. Three children are missing responses due to experimenter error (n = 1 at 9 months) and fussiness (n = 2 at 15 months).

Socioeconomic status

A Socioeconomic Status Questionnaire was administered to parents during the 15-month home visit. This questionnaire included educational attainment, in years, of both parents (when applicable), total family size, and annual household income. In all subsequent analyses, two measures of SES are reported: average parental education and income-to-needs (ITN) ratio. ITN ratios were derived by dividing reported annual household income by the federal poverty level for the given family size in the year data were collected.

Home environment

The Infant-Toddler Home Observation for Measurement of the Environment (IT-HOME; Caldwell & Bradley, 1984) was administered by a trained experimenter at the 15-month home visit. The IT-HOME is a 45-item structured interview and observational checklist that measures the quality of home life for children from birth to age 3. Items pertain to measures such as parental involvement, warmth, and responsiveness; discipline behaviors and routines; physical environment; and types of toys, books, and other materials available. Scores are based upon experimenter observations of the home environment as well as interview items administered to the parent. Test–retest coefficients for total HOME scores are all above .90, and interobserver agreement is at least 90%. Subscales of Support of Learning and Literacy (LL; includes items about child-directed language and provision of learning materials, such as "Parent reads stories to child at least three times weekly") and Parental Warmth (PW; includes items about parent–child relationships "Parent caresses/kisses/hugs child at least once during visit") were derived by summing the scores for the corresponding items (Fuligni, Han, & Brooks-Gunn, 2004). See Table S1 for a complete list of items included in each subscale. These specific subscales were selected as they have previously been shown to be internally consistent and to reliably predict children's cognitive and language skills in multiple large datasets (Fuligni et al., 2004). Alphas range from .62 to .82 for the PW subscale and .50 to .73 on LL.

Analysis plan

To test our three hypotheses, we planned to analyze (1) whether SES was associated with phonetic discrimination ability at 9 months; (2) if so, whether this association was partially mediated by the total HOME score; and (3) whether phonetic discrimination at 9 months would predict language ability at 15 months. Adjusting for multiple comparisons, our Bonferroni corrected p-value for these planned analyses is .017. Other analyses presented below were considered exploratory and were subjected to a p-value of .05.

RESULTS

Descriptive analyses yielded an average level of parent education of 15.07 years (SD = 1.36, range = 11.5–17), and an average family ITN ratio of 3.51 (SD = 2.62, range = 0.43–19.73; see Table 1). The majority of children were Caucasian (n = 69),

TABLE 1
Sociodemographic Characteristics.

	N	*M*	*SD*	*Range*
Age at 9 month visit	75	9.43	.46	8.46–10.30 months
Age at HOME	75	14.83	.53	13.05–16.59 months
Parental education	75	15.07	1.36	11.5–17 years
ITN	74	3.51	2.63	0.43–19.73
HOME-Total	75	40.95	3.13	27–45
HOME-LL	75	12.36	1.06	8–13
HOME-PW	75	6.65	.83	4–7

Note. ITN = Income-to-Needs Ratio, HOME-Total = Total HOME Inventory score, HOME-LL = Learning and Literacy, HOME-PW = Parental Warmth.

with an additional four children of mixed race, one Hispanic, and one American Indian. None of the children was exposed to any language other than English. There were no sex differences on the phonetic discrimination measure, the HOME Inventory, or the auditory component of the PLS. Females slightly but significantly outperformed males on the expressive language component of the PLS at 9-months, $t(72) = -2.26$, $p = .03$. Therefore, sex is included as a covariate in all analyses below that include the PLS-E.

Consistent with past research (Yeung & Werker, 2009), there was no significant difference across participants on the phonetic discrimination task between looking times for "same" ($M = 5.24$ sec, $SD = 2.57$) and "switch" ($M = 5.76$, $SD = 2.88$) trials, $t(74) = -1.40$, $p = .167$. However, large individual differences were present, with switch/same ratios ranging from 0.05 to 8.00.

To test our first hypothesis, we examined correlations between phonetic discrimination scores and measures of SES. Contrary to this hypothesis, the SES measures (average parental education and family ITN) were not significantly correlated with phonetic discrimination scores (PD), as shown in Table 2. We therefore were unable to test our second hypothesis, namely that socioeconomic disparities in PD would be mediated by the home environment. Instead, we next examined correlations between PD scores and the home environment (HOME score; $M = 40.95$, $SD = 3.13$, range = 27–45). Here, we found a significant negative correlation between phonetic discrimination scores and total HOME score, $r = -.34$, $p = .003$ (see Figure 1). The negative correlation indicates that infants with overall higher quality home environments tended to be less able to discriminate between two non-native phonetic contrasts—suggesting greater perceptual tuning to their native language. Additionally, when dichotomizing parental education, ITN, and total HOME score by median split, only high vs. low HOME score groups showed significant differences in phonetic discrimination, $t(74) = -2.34$, $p = .02$ (see Figure 2).

To further unpack the association between the HOME score and phonetic discrimination, we explored correlations between phonetic discrimination and the LL ($M = 12.36$, $SD = 1.06$, range = 8–13) and PW ($M = 6.65$, $SD = 0.83$, range = 4–7) subscales of the HOME. These analyses revealed a significant negative correlation between phonetic discrimination and the LL subscale, $r = -.42$, $p < .001$, but not between phonetic discrimination and the PW subscale (see Table 2).

TABLE 2
Correlations Between Socioeconomic Status, Home Environment, and Phonetic Discrimination Scores.

	Parental ED	*ITN*	*HOME-Total*	*HOME-LL*	*HOME-PW*	*PD*
Parental ED	–					
ITN	.42***	–				
HOME-Total	.29*	.16	–			
HOME-LL	.26*	.22	.68***	–		
HOME-PW	.15	.06	.72***	.49***	–	
PD	.06	.02	−.34**	−.42***	−.20	–

Note. Parental ED = Average parental education, ITN = Income-To-Needs, HOME-Total = Total HOME Inventory Score, HOME-LL = Language and Literacy score, HOME-PW = Parental Warmth score, PD = Phonetic Discrimination. *$p < .05$, **$p < .01$, ***$p < .001$.

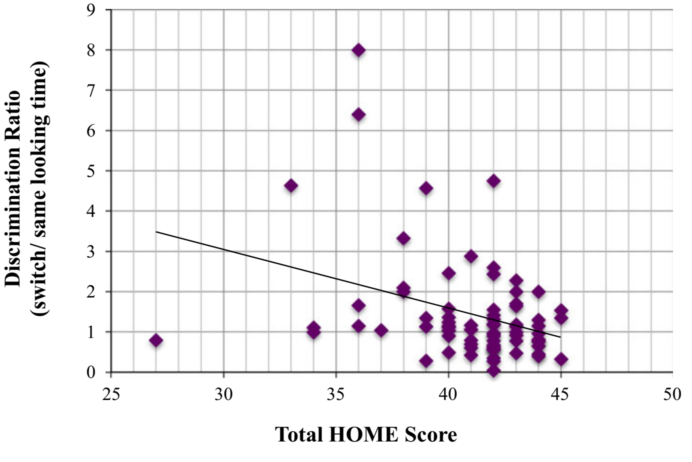

Figure 1 Correlations between total HOME score and phonetic discrimination ratio score.

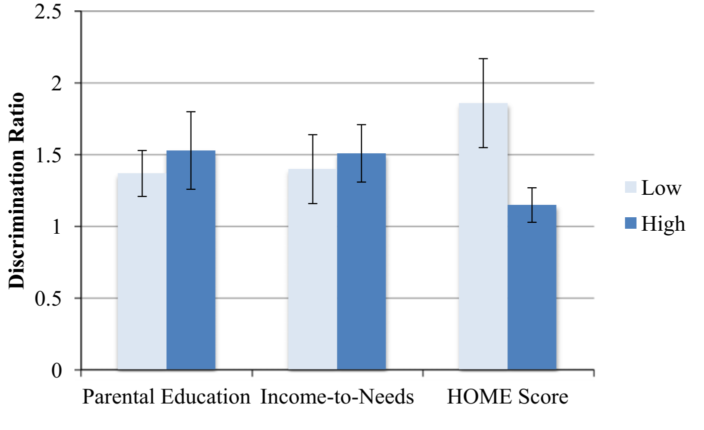

Figure 2 Group differences on phonetic discrimination task, by median split.

Because of the larger study design, phonetic discrimination was measured at 9 months, whereas the HOME was administered at 15 months. The correlation between phonetic discrimination scores at 9 months of age and HOME scores at 15 months of age is thus open to two mechanistic interpretations. One possibility is that the home environment at 15 months is very similar to the home environment at 9 months, and thus, infants living in a more cognitively stimulating home environment learn to perceptually tune to their native language—and lose the ability to discriminate non-native contrasts—earlier. Because the home environment was only assessed at 15 months, we were unable to directly test this possible interpretation.

A second possibility is that infants who show greater perceptual tuning at 9 months may have increased skill in other aspects of language development and thus may engender a more linguistically responsive home environment at 15 months. To consider this interpretation, we first examined correlations between HOME scores at 15 months and PLS scores at 9 months, as shown in Table 3. Only the 9-month expressive language score, and not the 9-month auditory score or the 9-month total PLS score, was significantly associated with the 15-month HOME score (r = .26; p = .03).

Next, we reasoned that if the data reflected that more linguistically advanced 9-month-olds were soliciting a more robust home language environment at 15 months, then the positive association between phonetic discrimination at 9 months and the home language environment at 15 months would be attenuated when adjusting for language ability at 9 months. To assess this, a regression analysis was performed, as shown in Table 4. Sex was included as a covariate, given that females slightly outperformed males on 9-month expressive language. Nine-month phonetic discrimination scores continued to be significantly associated with 15-month HOME-LL scores ($\beta = -.42$, $t = -3.82$, $p < .001$), even when adjusting for 9-month PLS-E scores. This suggests that the association between 9-month phonetic discrimination and the 15-month home environment is less likely to be driven by early language ability at 9 months, although of course this possibility cannot be entirely ruled out.

TABLE 3
Correlations Between Home Environment, Language Ability, and Phonetic Discrimination Scores.

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1. HOME-total	–									
2. HOME-LL	.68***	–								
3. HOME-PW	.72***	.49***	–							
4. PLS-total: 9 months	.18	.12	.16	–						
5. PLS-E	.26*	.11	.26*	.77***	–					
6. PLS-A	−.02	.05	−.05	.69***	.07	–				
7. PLS total: 15 months	.26*	.11†	.29*	.36**	.47***	.03	–			
8. PLS-E	.34**	.19	.40***	.29*	.52***	−.12	.69***	–		
9. PLS-A	.13	.03	.14	.29*	.27*	.14	.88***	.27*	–	
10. PD	−.34**	−.42***	−.20†	−.08	−.14	.02	−.16	−.12	−.13	–

Note. HOME-total = Total HOME Inventory score, HOME-LL = Learning and Literacy, HOME-PW = Parental Warmth, PLS-total = Total Preschool Language Scale Composite Score, PLS-E = Expressive Language Scores, PLS-A = Auditory Comprehension Scores, PD = Phonetic Discrimination. †p < .10, *p < .05, **p < .01, ***p < .001.

TABLE 4
Nine-Month Phonetic Discrimination, and Not 9-Month Expressive Language, is Related to 15-Month Home Language Environment.

	B	*SE B*	*β*
Sex	.18	.25	.08
PLS-E: 9 months	.003	.01	.03
Phonetic discrimination	−.33	.09	.42*

Note. PLS-E = Expressive Language Scores; R^2 = .19, *p < .001.

TABLE 5
Correlations Between PLS Raw Scores and Phonetic Discrimination Scores, Controlling for Sex.

	9-Month phonetic discrimination
9 Months	
Language composite	−.08
PLS—Auditory	.09
PLS—Expressive	−.17
15 Months	
Language composite	−.19†
PLS—Auditory	−.15
PLS—Expressive	−.17

Note. PLS = Preschool Language Scale. †$p \leq .10$.

Finally, to test our third hypothesis, we examined whether phonetic discrimination scores at 9 months were associated with language abilities at either 9 or 15 months. No significant correlations were found at either age, as shown in Table 5. There was, however, a trend for an association between 9-month phonetic discrimination and language scores at 15 months (p = .10).

DISCUSSION

Here, we have shown that the home environment, but not SES, is significantly associated with individual differences in phonetic discrimination ability as early as 9 months of age. In line with previous work, this relationship suggests that a linguistically rich home environment (Hoff, 2003b), particularly in terms of learning and literacy materials provided, may be critical to the development of early language skills.

We initially hypothesized a correlation between SES and phonetic discrimination ability at 9 months. Our results, in line with those of Tsao et al. (2004), do not support this. This lack of association is possible for a number of reasons. One possibility is that although the range of SES in this sample was relatively broad, a greater range of parental educational attainment and/or family income would be necessary to have the power to detect SES disparities in phonetic discrimination in a sample of this size. A second possibility is that SES is simply not a sensitive enough lens through which to view individual differences in this early linguistic skill, whereas the home environment more directly reflects individual differences in experience that account for differences in language development.

We did find a significant association between the home environment and phonetic discrimination. This association suggests two possible interpretations. One possibility is that infants with greater exposure to learning materials and opportunities in their home environments may develop stronger language skills. Alternatively, more linguistically advanced infants may engender richer home language environments and/or interactions (Song, Spier, & Tamis-Lemonda, 2013). The timing of our data collection (with phonetic discrimination measured at 9 months and the HOME administered at 15 months) limited our ability to directly address this question. However, previous research has shown the HOME Inventory to be relatively stable over this time period (Martin, Ramey, & Ramey, 1990; Rodriguez & Tamis-LeMonda, 2011). We therefore suspect that the 15-month home environment is likely representative of the 9-month (or earlier) home environment, and that the early home environment is driving this element of early language development.

In an attempt to assess the second possibility, we examined the association between phonetic discrimination and the home environment when adjusting for expressive language ability and found that the association between phonetic discrimination at 9 months and the home environment at 15 months remained significant even when controlling for language skill at 9 months. We therefore cautiously interpret the data to be more in line with the first possibility, that infants with linguistically richer home environments develop more advanced phonetic discrimination abilities at an earlier age. However, future work collecting data on each measure at all time points are necessary to provide better evidence concerning directionality.

Because phonetic discrimination was associated with the LL subscale of the HOME, but not the PW subscale, one possibility is that it is the language and learning environment of the home in particular that contributes to the early development of phonetic discrimination skills. Alternatively, the relatively limited range of PW scores may account for the null association with phonetic discrimination. Additional work more directly examining these components of the home environment is needed to further test this mechanistic hypothesis.

Finally, we did not replicate other work showing that phonetic discrimination at 9 months predicts later language ability. Consistent with the results presented here, however, past work has shown no associations between phonetic discrimination and language ability at around 14 months, but associations do emerge by 18 months (Kuhl, Conboy, Padden, Nelson, & Pruitt, 2005). It is therefore perhaps unsurprising that at 15 months of age, we found only a trend for this association. It is possible that, had we followed these children longer, a significant relation between phonetic discrimination and language ability would have emerged.

Several additional limitations of this work bear discussion. First, infants' phonetic discrimination ability was only measured at 9 months. As a result, we cannot say for certain that these infants' discrimination of non-native phonetic contrasts actually declined from an earlier point in time. Further, because we only examined non-native contrasts, we cannot be entirely sure that infants' perceptions of English contrasts were increasing concurrently. To address these constraints, future work should examine individual differences in both native and non-native contrasts longitudinally in order to obtain a more complete picture of how the home environment contributes to these skills. Finally, because these data were collected from a single urban Midwest community, the generalizability of these results may be limited.

The present study provides support for the hypothesis that the early home language environment plays a critical role in phonetic discrimination ability. To understand this relationship more fully, further research should be conducted measuring both the home environment and phonetic discrimination longitudinally during this time period. Additionally, more rigorous measures of the quantity and quality of language used during parent–child interactions should be collected to better assess the underlying mechanisms of this relationship in a more representative sample.

The findings presented here suggest that the quality of the early home environment may relate to the timing of phonemic perceptual tuning. These findings reinforce the importance of examining proximal factors that may affect early language development and delay.

ACKNOWLEDGMENTS

We gratefully acknowledge Janet Werker for providing stimuli, and Samantha Moffett and Elizabeth Victor for research assistance. This publication was supported by NIH Grants UL1TR000040, U01HD055154, U01HD055155, U01HD045991, U01AA016501, R37HD032773, and U01HD045935, as well as the Canadian Institutes for Advanced Research (CIfAR) to Janet Werker for development of the stimuli. The authors have no conflict of interest to declare.

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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article:

Table S1. Item-by-Item Breakdown of HOME Subscale Measures.