

Neighborhood linguistic diversity predicts infants' social learning

Chen Yingying

University of Wales Trinity Saint David

Abstract The direct interaction between infants and caregivers has proved to have a significant impact on social and cognitive development. In contrast, little is known about the impact of social environment on cognition, except for the direct interaction between infants and others (for example, the community in which infants live). The current research solves this problem by asking whether the linguistic diversity of neighbors can predict the tendency of infants to learn from different social partners. The data came from a series of experiments in which 19 month old infants from English speaking monolingual families received a paradigm test to assess their tendency to imitate the behavior of English or Spanish speaking adults. Babies living in more multilingual communities are more likely to imitate the behavior of Spanish speakers. This relationship was observed in two independent data sets and found to be independent of changes in infants' general imitation ability, age, median family income and population density. These results provide new evidence that infants' social learning is predicted by the diversity of the communities in which they live.

Introduction These data were collected from four experiments with 19 month old infants to assess whether community diversity alleviates this learning bias. These four experiments are from two groups of studies, which respectively examined the age and media influence of infants' willingness to imitate the information providers of their mother tongue (English) and foreign language (Spanish) (Howard et al., in publishing and in preparation). These studies found that infants and young children in some cases would resist informants who speak foreign languages, but also found that when faced with a live (rather than video) informant, 19 month old infants were equally likely to imitate the behavior of Spanish speaking and English speaking experimenters. In the analysis presented here, the researchers pooled data from these experiments to assess whether changes in adjacent language diversity could predict infants' responses to foreign speakers. We chose babies who only listened to English in their interactions with caregivers. These babies live in communities with varying degrees of linguistic diversity. By studying the relationship between neighbor language diversity and infants' tendency to imitate foreign speakers, we can test whether language information obtained outside the home will affect infants' social learning. In other words, these experiments provide an opportunity to isolate the potential impact of the social environment from the direct interaction of children with caregivers and family members.

Methods **1. Participants** The data are from four experiments to study the imitation of native speakers and foreign language speakers by 19 month old infants. Participants were 19 month old full-term infants from English speaking monolingual families in Washington, D.C. and Chicago metropolitan areas. The participants' age and demographic information are presented in Table 1

Table 1 Participant and demographic information for study samples 1 and 2.								
Analyses	Condition	N	Females	Males	Age in Mos	% "Other" Language	Median family income (per year)	Population density (people/square mile)
Between-subjects	Spanish	25	14	11	19.24 (±0.28)	20.84 (±11.65)	\$89,740.16 (±\$28,136.68)	4230.31 (±2328.09)
	English	25	13	12	19.11 (±0.27)	22.57 (±14.49)	\$92,725.72 (±\$27,336.25)	4596.96 (±2926.92)
	Total	50	27	23	19.19 (±0.28)	21.70 (±13.04)	\$91,232.94 (±\$27,496.22)	4413.63 (±2657.99)
Within-subjects	-	32	18	14	19.29 (±0.60)	18.67 (±14.81)	\$70,780.88 (±\$29,425.45)	7995.30 (±7243.76)

Note: For between-subjects analyses, planned contrasts revealed no significant differences between conditions in relation to: the percent of other languages present in the participant's neighborhood ($t(48) = .47, p = .57$), neighborhood median income ($t(48) = .38, p = .70$), or neighborhood population density ($t(48) = 1.23, p = .23$). In the within-subjects analyses, there were no conditions and therefore no demographic differences to examine.

2. Procedure Infants were tested in either in a between-subjects or a within-subjects imitation paradigm. In the between-subjects paradigm (dataset 1), infants observed either an English-speaking or a Spanish-speaking experimenter performactions on a series of novel toys (see Table 2 for a description of the toys and their associated actions) . In the within-subjects paradigm (dataset 2), one English- and one Spanish-speaking experimenter were simultaneously present and demonstrated different actions on the same toy. Infants viewed either six novel toys with one associated manner action (between-subjects design, data set 1) or three novel toys with two associated manner actions (within-subjects design, dataset 2).

Table 2 Stimulus toy sets and their associated manner and goal actions.			
Stimulus toy set	Manner action	Goal action	Final goal
Head-light*	Place head on light (place elbow on light)	Push light	Light turns on
Button-box	Place object 1 on button (place object 2 on button)	Push button	Noise sounds
Hinged-box	Brush top of box with object (knock side of box with object)	Open box	Retrieve toy from inside box
Velcro-tube	Place velcro handle on top of tube	Shake tube	Tube makes noise
Knock-box	Knock on outside of box with fist	Open box	Retrieve toy from inside box
Elbow-box	Use elbow to open slide-box	Open box	Retrieve toy from inside box

Note: All stimulus toy sets were utilized in the between-subjects paradigm (dataset 1). Only those sets with an asterisk were utilized in the within-subjects paradigm (dataset 2). Actions in parentheses denote alternative actions created for the within-subjects design.

Results Analysis of Dataset 1 assessed whether adjacent linguistic diversity predicted infant responses under the inter-subject paradigm. Analysis of dataset 2 revealed a similar pattern of discovery in the within-discipline paradigm.

Table 3
Infant imitation scores for English- and Spanish-speaking presenters in between- and within-subjects analyses.

Analyses	Presenter language	% Imitation
Between-subjects	Spanish	51.72 (±15.46)
	English	56.68 (±18.68)
Within-subjects	Spanish	37.44 (±25.18)
	English	30.44 (±23.90)

Note: For the between-subjects analysis, an independent t -test revealed no significance between children in the English or Spanish conditions ($t(1, 48) = .71, p = .48$). For the within-subjects analysis, a paired t -test revealed no significant difference between English- and Spanish-speaker imitation rates ($t(1, 31) = 1.08; p = .29$).

Table 4
Regression analyses for dataset 1 (between-subject design) and dataset 2 (within-subjects design).

	Dataset 1 standardized β (se)		Dataset 2 standardized β (se)	
	English-speaking presenter	Spanish-speaking presenter	English-speaking presenter	Spanish-speaking presenter
Percent other languages	-.003 (.004)	.556 (.003)*	-.179 (.005)	.492 (.019)*
Age	.3421 (.136)	.092 (.095)	-.003 (.106)	.088 (.078)
Median income	-.262 (.000)	-.202 (.000)	-.312 (.000)	-.140 (.000)
Population density	-.358 (.000)	-.102 (.00)	-.054 (.000)	-.038 (.000)
R ²	.291	.316	.101	.258

* Note: $p < .05$.

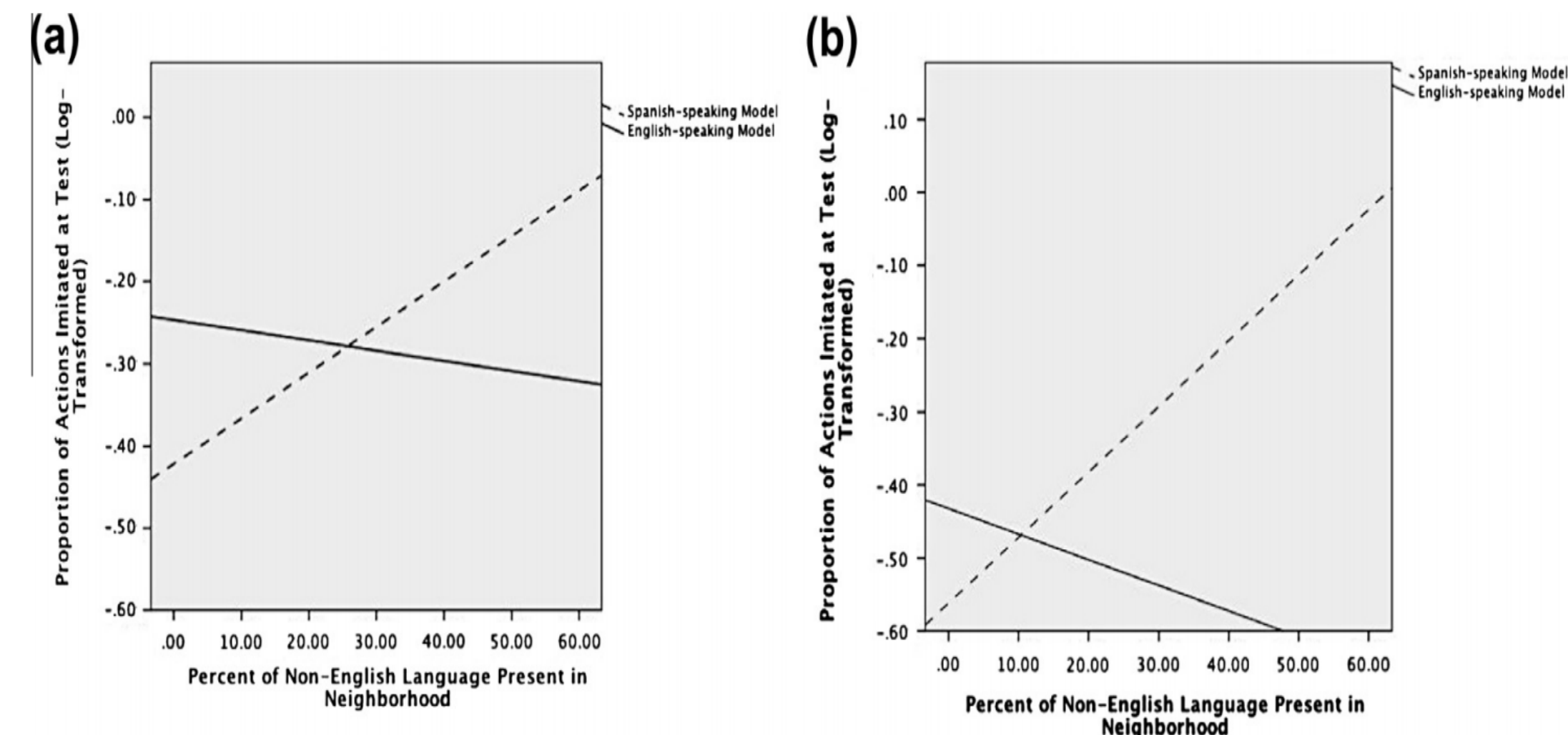


Fig. 1. (a) Dataset 1 (between-subject) relationship between neighborhood linguistic diversity and imitation of English- or Spanish-speaking model. (b) Dataset 2 (within-subject) relationship between neighborhood linguistic diversity and imitation of English- or Spanish-speaking model.

Discussion On a very broad level, our results suggest that the best way for infants to understand social cognitive development is by considering social contexts that can inform and influence developmental processes in different ways. In fact, studies of older children have proven that.. We believe that by integrating the understanding and insights on infant social cognitive development, will enrich the scientific understanding of infant social cognitive development, these institutions work methods related to the laboratory, explore the infant social cognitive ability method, such an investigation will enable us to better understand the way the social environment shapes the young people's mind.

Conclusion

- Neighborhood language diversity predicts infants' imitation of foreign language users.
- The infants included in the study heard English only from their parents and caregivers.
- Family income and community population density do not affect infants' imitation.
- Research findings reveal the unique impact of community diversity on infant learning

References

- Lauren H. Howard, Cristina Crrarazza, Amanda L. Woodward University of Chicago, Chicago, IL, United States
- Bar-Haim, Y., Ziv, T., Lamy, D., & Hodes, R. M. (2006). Nature and nurture in own-race face processing. *Psychological Science*, 17, 159–163.
- Buttelmann, D., Zmyj, N., Daum, M. M., & Carpenter, M. (2013). Selective imitation of in-group over out-group members in 14-month-old infants. *Child Development* 84, 422–428.