Learners attend to color when exposed to minimally different language varieties

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Bilingualism researchers have used faces as a more naturalistic cue for eliciting language switches. Results from an fMRI study conducted by Li et al. (2013), which used Asian and Caucasian faces to elicit names of objects in Chinese and English respectively, suggest that racialized faces facilitate processing of a target language among Chinese/English bilinguals. However, these results do not explain why racialized faces would facilitate processing. Woumans et al. (2015) used racially comparable faces with Spanish/Catalan and Dutch/French bilinguals, and found that familiar faces facilitated processing. Given how typical language acquisition of spoken languages involves both auditory and visual cues provided from faces (Kuhl & Meltzoff, 1982; 1984), proficient bilinguals may utilize familiar features from faces as a language cue. The present study employs an artificial language learning paradigm that manipulates speaker faces and prosodic cues to investigate how strongly bilingual learners attend to speaker faces as they acquire two languages simultaneously. **Our main research questions aimed to address: (i) whether faces and/or prosodic differences affect learning, and (ii) how well learners associate faces with languages during learning.**

[METHODS] To answer these questions, adult English monolinguals were exposed to two artificial languages (LangA [see tbl1], LangB [see tbl2]) with the same underlying word order (ABCDEF a lá Thompson & Newport, 2007) but had *different lexicons* and *different speakers*. To avoid introducing pre-existing racial biases, we used alien faces with non-human skin tones. Participants were randomly assigned to one of *two prosodic conditions* (see fig1A): same prosody (n=23) or different prosody (n=23). In both conditions, participants received equal amounts of exposure for both languages. Participants completed 5 exposure sessions within 7 calendar days, as well as a sentence test and a speaker identification test after session 5. The sentence test was a two-alternative forced choice task (2AFC), presenting two novel six-word sequences that either adhered to the grammatical and prosodic patterns of one language or violated either the grammatical or prosodic patterns of that same language. The speaker identification test was also a 2AFC task, presenting two alien faces for a novel six-word sequence from a target language. Test results were subjected to binomial generalized linear models that treated language (A,B), prosodic condition (same, different), and order of acquisition as predictors.

[RESULTS] We used results from the sentence test to measure how faces and/or prosodic differences affect bilingual learning (see fig1B). Results revealed only language as a significant predictor on accuracy, though participants were well above average chance for both LangA (M=76.9%) and LangB (M=81.4%). **Participants' learning was unaffected by face or prosodic differences.** We used results from the speaker identification test to determine how well learners associate faces with languages during learning (see fig1C). Using the two faces they saw during exposure, we tested how well participants attended to the alien face they saw for each language. Results revealed that **participants with higher sentence test accuracy were more accurate recognizing the face for langA and less accurate recognizing the face for langB.** Using two unfamiliar faces that either differed by color or face shape as compared to the familiar face for a given language, we tested whether participants attended more to color or face shape during learning. Results revealed a difference by language depending on whether there were prosodic differences. **When exposed to prosodically similar languages, participants selected aliens by color for langB more strongly.**

Overall, adult learners do not strongly associate faces with languages during learning. However, color may become more salient when there are fewer linguistic cues to differentiate between languages in the learner's input. Future work with human faces will determine whether this generalizes to skin tones and/or reflect racialized biases such that faces serve as a proxy for race.

A	B	C	D	E	F
daffin	spad	fluggit	nerk	tomber	prog
klidum	gentif	lapal	bliffin	bleggin	zemper
mawg		frag		flairb	
zub		glim		roy	

Table 1: Language A (LangA) - Lexical items organized by category

A	B	C	D	E	F
palug	glet	razzik	dalk	lompel	firg
dilba	pawgif	balap	nawgib	dadun	zelbaw
balm		zerk		dawrb	
mip		grawf		nei	

Table 2: Language B (LangB) - Lexical items organized by category

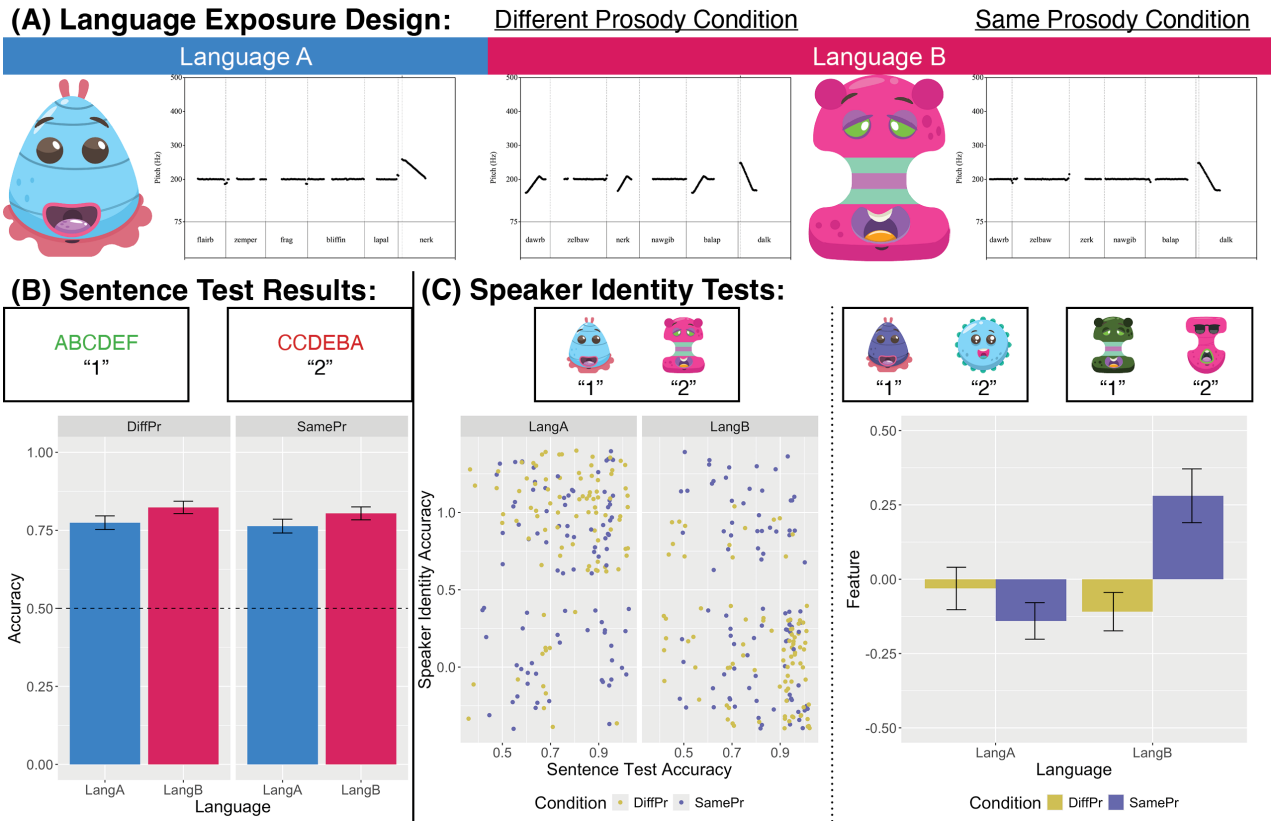

Figure 1: Exposure and Test Designs - (A) Participants were assigned to one of two prosodic conditions; (B) Results from 2AFC task measuring word order learning indicate both groups successfully learned the underlying word order for both languages; (C) Results from 2AFC task measuring sensitivity to speaker faces by language reveal different patterns by prosodic conditions.