

Two Faces, Two Languages:
How Facial Cues Modulate Bilingual Language Activation

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INTRODUCTION

Previous studies of lexical processing in bilinguals indicate that bilinguals activate both languages in parallel while speaking or listening to only one language (e.g. Dijkstra & van Heuven, 1998, Marian & Spivey, 2003). Brain imaging studies show the neural correlates associated with language control as a result of the parallel activation (Price et al., 1999; Crinion et al., 2003; van Heuven et al., 2008). Bilinguals must use cues from the external linguistic environment or from the internal structure of the linguistic material to help them avoid significant interference from the un-intended language. Just what cues are used effectively by bilinguals is a topic of active investigation.

In this study, we investigate the role of facial cues in modulating the activation of the bilingual’s two languages. Facial cues provide the interlocutors’ linguistic identity, though not always reliably, in the bilingual language environment. We manipulate the variable of language (L1 vs. L2) and face identity (Asian vs. Caucasian).

METHOD

Participants: Fifteen Chinese-English bilinguals (eight females; mean age of 24.44 ± 3.43 years) from the Pennsylvania State University participated in the experiment and received payment for their participation. All bilinguals were Chinese native speakers. A language proficiency questionnaire (Li, Stojanoski and Zhao, 2003) was administered to assess self-reported English learning history and proficiency in the bilingual’s two languages. The average age of acquisition is 11 ± 2.6 years. The self-reported proficiency scores in the English (English) were 5.14 ± 0.86, 4.64 ± 0.63, 4.5 ± 0.94, and 4.86 ± 0.86, for reading, writing, speaking and listening, respectively, on a scale of 1 (poor) to 7 (very fluent).

Task: In the experimental conditions, participants were asked to name the picture in the frame. The picture frame was held by a male or female person with Asian or Caucasian facial features. The picture frame was either in red or blue, as cue to naming in either L1 (Chinese) or L2 (English). A baseline task involved the participants’ looking at a crosshair. Pictures were selected from Bates et al. (2003) and Liu et al. (2011) and were controlled for frequency, naming consistency, age of acquisition, and familiarity.

RESULTS

Behavioral Data: A two-way ANOVA showed that response times (RT) were faster for congruent conditions than for incongruent conditions. There was no significant difference between naming in the L1 (Chinese) vs. naming in the L2 in terms of RT, but L1 was named more accurately than L2. No other effects were significant.

Imaging Data: Fig. 2 presents peak activations as a function of language (L1 vs. L2) and face (Asian vs. Caucasian). The language effects were mainly due to the difference between L1 and L2, in that a set of bilateral frontal, temporal and parietal areas (e.g., BAs 10, 11, 19) were activated more strongly in L1 than in L2. The face effects were due to the temporal and occipital areas (e.g., BAs 17, 18, 39) during face processing. Paired-samples t-test showed that significant activations are in the right medial frontal and parietal regions for Asian faces, while significant activations are in the inferior frontal gyrus, cingulate gyrus, and the insula for Caucasian faces.

DISCUSSION

Our study indicates that facial features of the listener help to modulate bilingual language activation in terms of conflict between the naming language (L1 or L2) and the linguistic identity of the face (Asian or Caucasian). When language and face are consistent for naming, increased activations are seen in bilateral medial frontal and parietal regions in L1. Consistent facial information aids in monitoring conflict, as the medial prefrontal cortex is shown in previous research to play an important role in performance monitoring (Ridderinkhof et al., 2004). In the case of L2, structures implicated in cognitive control (bilateral IFG and cingulate cortex) become more strongly activated, indicating that with consistent facial information the bilingual is better able to produce words in their weaker language L2, although perhaps through effortful processing (as seen in strong right insula activation). Future studies will compare these findings with data from ER designs to further investigate effects of language control in switching conditions. Connectivity analyses will also help to determine the interaction between face processing and bilingual language processing.

REFERENCES


Matrix size = 64 x 64; Slices = 34; Slice Thickness = 4 mm

DISCUSSION

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