Bilinguals Switch Gesture Production Parameters when they Switch Languages

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Abstract

The control mechanism at play when bilinguals speak one of their two languages (inhibition of the unintended language vs selection of the intended language) is still under debate. Though transfer in spoken languages has been studied extensively, transfer in gesture is understudied. In this research, we investigated gestural communication in bilinguals. In particular, we tested which aspects of gestures were "transferred" from a language to another. In this study our focus is on **gesture rate** and **gesture space** in Italian/English bilinguals. Contrary to previous findings, we have no evidence of transfer. When bilinguals switch language, their gesture parameters switch accordingly. The switch of gesture (cultural) parameters such as rate and salience show that language and gesture are tightly linked. This suggests that a language and the corresponding gesture parameters might be selected in a high level processing stage at which verbal and nonverbal aspects of communication are planned together.

Keywords: bilingualism; linguistic transfer; gesture transfer; lexical access.

Introduction

Different languages and cultures use gestures differently. For example, Italian is reported as a high gesture frequency language (Barzini, 1964; Kendon, 1992), as opposed to (British) English, described as a low gesture frequency language (Graham & Argyle, 1975).

When bilinguals speak in one language, aspects of the language not being spoken can be incorporated in the language being spoken. This is called transfer. Researchers have been interested in whether bilinguals transfer "gesture style" from one language to another or create a third different gesture style. Gesture transfer (or lack thereof) will give an insight into how gesture and language are linked in production. It will also help us better understand the so called "hard problem". The "hard problem" refers to how speakers retrieve the lexical item that corresponds to a specific target concept. Lexical access is supposed to be particularly hard for bilinguals, because to every concept there are at least two synonymous lexical nodes associated, one per language (see Finkbeiner et al., 2006 for a review). Three models have been proposed to describe how lexical access may occur: the lexical selection mechanism (according to which the lexical access is not competitive across languages but only within languages, see for example Costa & Caramazza, 1999), the inhibitory control model (the hard problem is solved by suppressing the lexical nodes in the non-target language, Green, 1986; 1998) and the concept selection hypothesis (the intended language is selected at the conceptual stage after a series of communicative aspects have been taken into account, La Heij, 2005).

With regards to gestures, it has been claimed that bilinguals' gesture use is linked to their proficiency in the two spoken languages. A common measure of the relationship between gesture and speech proficiency is the gesture rate (number of gestures performed over the number of words uttered). Some studies have analyzed gesture rate in bilinguals. Sherman and Nicoladis (2004) found no differences between bilinguals' gesture rate in their two languages when participants have an equal proficiency in both their languages (Canadian English and Spanish, where Spanish is supposed to be a high frequency gesture rate language). Those studies (Nicoladis et al., 1999; Pika, et al., 2006), however, lack one of the monolingual control groups (see Nicoladis, 2007). In a recent study on English/French bilingual children in Canada, Nicoladis and colleagues (2005) found that bilinguals tend to gestures more than the two monolingual control groups, but no evidence for gestural transfer was found. On the other hand, a study by So (2010) found that English/Chinese Mandarin bilinguals gestured more when speaking Mandarin than the Mandarin monolingual control group, and when speaking English, they gestured at about the same rate as English monolinguals.

Another gesture parameter that varies across cultures is gesture size. Since the seminal study of Efron (1941/1972) comparing Jews and Italian immigrants' gestures, we know that in different cultures gestures differ in how they are performed in the space. More recently, Müller (1998) compared the gesture space of native Spanish and German speakers involved in a naturalistic conversation task with a language matching confederate. She found that Spanish speakers produced more gestures in the space above their shoulder than German speakers. Interestingly, Müller did not find different gesture rates between German and Spanish. She suggested that the difference in gesture salience create an 'illusion' that Mediterranean region cultures gesture more frequently than north European cultures.

Because of the lack of a clear pattern of results from previous studies, the aim of this work is to shed light in the

matter of bilinguals' gesture rate and space and in the relationship between gesture and language in bilingual. In addressing the question whether Italian/(British) English bilinguals gesture differently from the two monolingual control groups, we have been careful on having two monolingual control groups of English and Italian speakers matched with the bilinguals for gender, age and education background. We focused on gesture rate and gesture space of highly proficient Italian/English early bilinguals (i.e. they learned both languages before age 6) who had a very similar fluency in both languages. Bilinguals and monolinguals described the exact same stimuli in each language to a language matching confederate speaker. After coding their speech and gesture production, we compared gesture rate and gesture salience across languages (English or Italian) and language statuses (bilinguals or monolinguals). We hypothesized that transfer could occur in either direction: from English to Italian (meaning that bilinguals when speaking in Italian will transfer the gesturing pattern from English, gesturing less and smaller than Italian monolinguals) and from Italian to English (meaning that bilinguals when speaking in English will transfer the gesturing pattern from Italian, gesturing more and bigger than English monolinguals).

Method

Participants

30 participants (10 English native speakers, Females= 8, age mean=22.3 years recruited at the University of Birmingham; 10 Italian native speakers, Females=8, age mean=23.1 recruited at the University of Trento; and 10 English/Italian bilinguals, Females=8, age mean=23.8 recruited at the University of Birmingham and Trento) took part to the experiment. All the participants took a test to assess their linguistic background (Gullberg & Indefrey, 2003) and the Controlled Word Association Test (COWAT; see Loonstra et al., 2001 for a review) in English and Italian. The COWAT scores ensured that participants were equally fluent in both languages. The mean fluency score for bilinguals was 62.8 words in English and 62.2 words in Italian. The mean fluency score for Italian native speakers was 63.4 and for English native speakers was 61.7 words.

The bilinguals enrolled in this study started speaking both languages before age 6, while the native speakers of Italian and English did not learn any other language before age 11 and were not fluent respectively in English or Italian. They were all students enrolled at university bachelor or master degrees.

Materials

Participants watched 10 Tomato man stimuli (Özyürek, Kita, & Allen, 2001) depicting two characters (i.e. Tomato man and the green Triangle) performing some actions (Fig. 1, left panel). The goal of these stimuli was eliciting the description of manner and path in the verbal and gesture modality as the participants described Tomato and Triangle

actions. The stimuli were presented on a 13-inch TFT monitor at a resolution of 800x600. Stimulus presentation was controlled by a PC running Power Point. The participants were audio and video recorded with a Sanyo Xacti HD2000 camera at a medium shot (i.e. they were shot from up their head to their knees, Fig. 1, right panel).
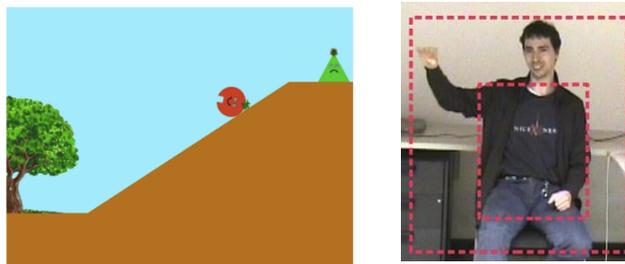

Figure 1: On the left panel, an example of the Tomato man cartoons used to elicit participants' gestures. On the right panel, a participant describes the cartoon. The dotted concentric squares define the gesture space: centre (the inner square) and periphery (the outer square).

Procedure

Participants were seated at approximately 40 cm from the computer screen. An assistant pressed the mouse button to start the experiment. After the participants saw the first stimulus they turned toward a listener sitting near the camera and described what they had just seen. The monolingual participants repeated the task twice in the same language to two different listeners who are native speakers of the relevant language. The bilingual participants repeated the task once in Italian, talking to a native speaker of Italian, and once in English to a native speaker of English.

The order of the stimuli was counterbalanced. In particular the stimuli run from clip 1 to clip 10 for the forward order and from 10 to 1 for the backward one. For bilinguals, the order of the two languages was counterbalanced across participants.

Data Annotation and Analysis:

Transcription

Two native speakers of Italian and English transcribed the videotapes following the instruction manual. Disfluencies, repetitions and laughter were transcribed with special fonts. All the transcriptions were reported in Elan 4.3.3 to ensure a correct time alignment with coverbal gestures.

Gesture Coding

We coded the gestures produced by participants when telling the whole cartoon to the listeners.

In this paper we focus on two main aspect of gesture production:

Gesture Rate: was calculated as the number of gesture produced by each participant describing each cartoon over the number of words produced in each cartoon description (Ngestures/Nwords).

Gesture Salience: Gesture salience was coded for the target gesture performed during the cartoon description (e.g. rolls up. Tumble down etc.). To code salience we followed McNeill (1992), who divided the gesture space into sectors using a system of concentric squares. Our annotation coding scheme reflects this notation dividing the gesture space in 2 sectors (see Fig. 1, left panel): "centre" and "periphery" expressed respectively with 0 (not salient) or 1 (salient).

To ensure the reliability of the adopted coding scheme, a subset of the corpus (659 gesture tokens) was annotated by three independent coders. For gesture salience we found a high agreement above the chance level (Kappa = 0.89).

Results

Gesture Rate

A linear mixed model was performed on Gesture Rate (sample size n=390). We fit the linear mixed model on gesture rate using a "maximum model random slopes" approach, i.e. calculating random (slopes and intercepts) effects for subject and item as well as the interaction between language and language status (Barr et al., 2013). The model that better described the variance of the data had random intercepts for subjects, random intercepts for items (cartoons) and Language (English or Italian) varying by subjects random slopes.

We found a significant effect for **Language** (Est. =0.06, S.E.= 0.01, p<0.001), such that the gesture rate is higher in Italian than in English, but no significant effect for Language Status (monolingual or bilingual; Est.=-0.02, S.E=0.02, p=0.19). In Fig. 2 we report the mean values of gesture rate for each group (monolingual or bilingual) in each language (Italian and English).
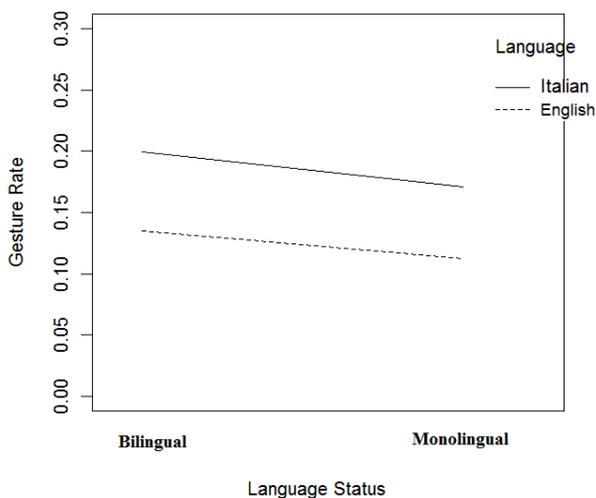

Figure 2: Mean values of gesture rate for Language Status (Bilingual or Monolingual) in each Language (Italian, solid line, and English, dotted line).

Gesture Salience

A generalized mixed linear model was performed on gesture salience (sample size n= 390). Following the same procedure described for gesture rate, we set for model that had by item (cartoons) random intercepts, by subjects random intercepts and Language (English or Italian) varying by subjects random slopes

We found a significant effect for both **Language** (Est=1.85, S.E.=0.38, p<0.001) and **Language Status** (Est.=0.98,S.E.=0.39, p=0.01). That is, gestures were more salient in Italian than in English and bilinguals' gestures were more salient than monolinguals'. In Fig. 3 we report the probability of producing salient gestures in each Language Status (bilingual and monolingual) and each Language (Italian and English).
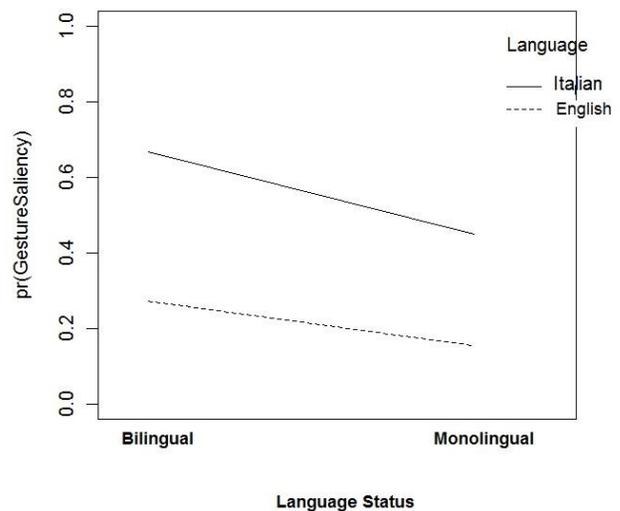

Figure 3: Probability of producing a salient gesture for Language Status (Bilingual or Monolingual) and Language (Italian, solid line, and English, dotted line).

Discussion

The aims of this study were to investigate gesture rate and gesture space in Italian/English bilinguals and the relationship between gesture and language in bilinguals. In addressing this question, the data from a bilingual and two monolingual control groups have been collected and analysed.

A first result was that Italian speakers gestured more frequently and that their gestures were more salient than English speakers. As observed by Kendon (1992) and Efron (1972) Italian is indeed a "high gesture culture". This is compatible with other Mediterranean cultures and languages such as Spanish (Muller, 1998).

As regards bilinguals, we found no evidence of transfer for gesture rate when bilinguals switch from Italian to English. With regard to salience, we found, again, no evidence of transfer but, overall, bilinguals' gestures were more salient with respect to the gestures performed by the two control groups. From our results we can conclude that

when English/Italian bilinguals switch language, their gesture parameters switch accordingly with the language they talk.

Whether or not one finds gestural transfer in bilinguals may depend upon many variables. First of all, the societal context for bilingualism and the bilingualism level of the participants are factors that affect transfer. Unlike the current study, So (2010) found evidence of transfer for representational gestures only from American English (high gesture rate) to Mandarin-Chinese (lower gesture rate) in Singapore. In Singapore multilingualism is a long established and prominent feature of the society, encouraged by laws. Bilinguals in Singapore might have been much more exposed to two or more languages in daily life and it has been documented that transfer of words occurred together with gesture rate transfer (So, 2010). On the contrary, the bilinguals who took part in this study mostly grew up in non bilingual communities (in Italy or the UK) where one of the two languages was mostly spoken with parents, family members and friends. Although bilingual participants reported in the Linguistic Background Questionnaire (Gullberg & Indefrey, 2003) that to them it was important to speak well both languages and they equally liked to speak in both, it might be that it is easier for the bilinguals tested in our study to "keep apart" the two linguistic systems. The bilinguals in this study had some tip-of-the-tongue phenomena but did always choose to talk in the target language.

One of the most interesting findings of this study is that bilinguals' gestures were overall more salient than monolinguals' gestures in both languages. Holler and Stevens (2007) found that speakers produce more salient gestures when they convey new information to the listener; another study showed that participants gesture bigger when they are particularly motivated to communicate clearly (Hostetter, Alibali & Schrager, 2011) One possible explanation for the higher salience of bilinguals' gestures is that bilinguals may often be in a communicative situation where some people are weak in Italian and others are weak in English. In such situations, bilinguals may make their gestures more salient in order to facilitate communication. This might become a habitual feature of bilinguals' gestures. This speculation though needs to be substantiated by future studies.

Regarding the hard problem, i.e. lexical access in bilinguals, our results indicate that language and gesture, even gestural "cultural" parameters such as rate and salience, are tightly linked. This finding suggests that the features specifying a language and the corresponding gesture parameters might be selected at a preverbal stage in which verbal and nonverbal aspects of communication are planned together. This is compatible with the idea that bilinguals specify the language at a conceptual level, as suggested by La Heij's concept selection hypothesis (2005).

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