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Phonetic adaptation in non-native spoken dialogue: Effects of priming and audience design

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ABSTRACT

To be understood, non-native speakers must adapt their speech in order to produce contrasts in their second language (L2) that are not present in their first language (L1). Here we examine mechanisms hypothesized to facilitate such adaptation within spoken dialogue: *priming*, *affiliation*, and *audience design*. In two experiments, Korean non-native speakers of English interacted in a referential communication task with a Korean English-speaking confederate (Experiment 1) and a monolingual American English-speaking confederate (Experiments 1 and 2). The task required them to spontaneously produce labels containing segments from English that do not exist in Korean (/æ/ and coda /b/), which, when spoken with a Korean accent, can result in ambiguous homophones (e.g., *pat* pronounced like *pet*, or *mob* pronounced like *mop*). The Koreans produced more English-like phonetic segments not only immediately after hearing similar segments primed by the American partner, but also when the task required the partner to distinguish two potentially ambiguous items. The first time the Koreans referred to potentially ambiguous objects, utterances took longer to initiate; once they were aware of the potential for ambiguity, initiating contrasting labels took no more time than initiating labels primed by the partner. Findings suggest that priming effects in dialogue are not obligatory but may be motivated, and that phonetic adaptation is shaped by awareness of a partner's pragmatic needs.

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Introduction

One of the major challenges to understanding how people process and represent speech comes in the form of the enormous variability an individual encounters on a daily basis. Sources of this variability include speaker physiology, dialect, and the speaker's language background. Variability is particularly challenging when native and non-native speakers come into contact; when a non-native speaker's first language (L1) lacks a phonetic segment or segmental contrast included in the second, target language (L2), the result can range from mildly to heavily foreign-accented speech. Virtually everyone encounters foreign-accented speech; given the increasing interconnectedness and mobility of the worlds' populations, this phenomenon can only be increasing.

One way in which speakers respond to variability is by adapting the way in which they speak, often producing forms that they have just heard from another speaker. For example, after hearing a double object construction (e.g., *I gave you the book*), speakers tend to reproduce the same syntactic structure (e.g., *He threw her the ball*) rather than a prepositional phrase (e.g., *He threw the ball to her*) (Bock, 1996; Branigan, Pickering, & Cleland, 2000). At the

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lexical level, two partners in conversation typically come to use the same or similar referring expressions, providing evidence that they share a perspective and are referring to the same thing (Bortfeld & Brennan, 1997; Brennan & Clark, 1996; Garrod & Anderson, 1987). And at the phonetic level, speakers often (albeit not always) adapt their pronunciation toward that of a partner or even to that of passively heard speech (e.g., Babel, 2010; Giles & Powesland, 1975; Kim, 2012; Kim, Horton, & Bradlow, 2011; Pardo, Cajori, & Krauss, 2010; Pardo, Gibbons, Suppes, & Krauss, 2012; Willemyns, Gallois, Callan, & Pittam, 1997). Here, we examine the forces underlying adaptation in interactive spoken dialogue, through the lens of accented speech produced by non-native speakers.

Theoretical accounts of adaptation

Of theoretical interest is why and how adaptation happens; several accounts have been proposed. A *priming* account says that adaptation occurs automatically and passively, after a speaker is primed with a similar form. This sort of explanation underlies the "output–input coordination" account of Garrod and Anderson (1987), as well as the view that adaptations are "generic" or driven by what is easiest for speakers, even when helpful to addressees (Brown & Dell, 1987; Dell & Brown, 1991). More recently, priming was incorporated as a cornerstone of the "interactive alignment" account of Pickering and Garrod (2004). To the extent that adaptation is driven by priming, this suggests that it is inflexible and possibly encapsulated from slower, higher-level pragmatic influences (e.g., see proposals by Brown & Dell, 1987, Barr & Keysar, 2002, and Pickering & Garrod, 2004). Although the interactive alignment account was modified somewhat in Costa, Pickering, and Sorace (2008) to account for lower rates of adaptation on the part of non-native speakers, these proposals still posit priming to be a default process, with pragmatic adaptation taking additional time. The interactive alignment account has been offered as a general explanation at multiple linguistic levels of adaptation in dialogue, including at the lexical, syntactic, and phonological levels (see also Pickering & Garrod, 2013, for an update that focuses on automatic co-activation of neural systems for perception and action rather than on a "priming" explanation per se).

Another account, which we will call *affiliation*, focuses on sociolinguistic forces (such as those addressed by accommodation theory, Giles & Powesland, 1975), including the status and group identity of a partner, and the speaker's relationship with that partner. On this approach, adaptation in speaking is considered to be due to factors such as the desire to show solidarity, or to affiliate with, or to mark one's membership in, a social group or category (Beebe, 1981; Giles & Powesland, 1975; Gumperz, 1982). This approach accounts for not only how speakers tend to become more similar in their speech patterns, but also how they may diverge in situations in which they disagree or do not wish to affiliate with one another (see, e.g., Babel, 2010, 2012; Bly, 1993; Bourhis & Giles, 1977; Kim, 2012; Kim et al., 2011; Willemyns et al., 1997). The affiliation account predicts that adaptation is used to actively define and acknowledge speakers' identities and relationships.

On the third account, which we will call audience design,[1] adaptation is shaped in a way that is partner-specific, in that it is responsive to the perceived needs of a partner at a particular point in the conversation. For example, partners in a conversation typically come to *entrain* on the same terms in referring to an object, a way of marking that they believe they share a conceptual perspective on it (Brennan & Clark, 1996; Clark & Wilkes-Gibbs, 1986; Metzing & Brennan, 2003). This adaptation is flexible; that is, a previously entrained-upon referring expression is revised when a change of context requires more information to uniquely identify the referent or (sometimes) when a new addressee enters the conversation. When context changes such that a *less* informative expression could suffice to identify the referent, speakers tend to continue using the over-informative entrained-upon expression with the same partner (rather than break the conceptual pact they have established), but less so with a new partner (Brennan & Clark, 1996). This effect has also been shown in comprehension: Addressees experience interference or delay when a speaker appears to abandon a previously entrained-upon expression and uses a new expression for no apparent reason, but not when a *new* speaker uses the same new referring expression (Metzing & Brennan, 2003; replicated by Matthews, Lieven, & Tomasello, 2010).

The theoretical mechanisms underlying the three accounts outlined above—priming, affiliation, and audience design—need not be mutually exclusive of course, but could work in concert to shape adaptation in spoken dialogue. However, the priming account differs from the other two in its predictions about the *timing* with which such adaptation occurs. Most accounts that appeal to priming as an explanation argue specifically for a modular, two-stage architecture. These include the interactive alignment proposal with its immediate priming and delayed use of "full common ground" (Pickering & Garrod, 2004); the *dual process hypothesis* (Bard et al., 2000; Bard & Aylett, 2000), in which automatic processes (such as articulation) are considered to be obligatory and therefore not influenced by audience design; and the *perspective adjustment* account (including Horton & Keysar's, 1996 *monitoring-and-adjustment* model for production and Barr & Keysar's, 2002 *anchoring and adjustment* heuristic for comprehension) in which a fast-acting, inflexible, "egocentric" stage precedes a slow-acting, inferential, partner-specific stage (see also Brown & Dell, 1987). This implies that adaptation due to priming should take place rapidly, whereas an adaptive response that is not preceded by a prime should take place more slowly.

Explanations that attribute adaptation to sociolinguistic factors (such as affiliation) do not necessarily make a commitment a priori to any particular psychological model, so do not lead to specific predictions about the timing with which inferences are made (although some, e.g., Babel, 2010 and Kim, 2012, examine both issues in tandem).

[1] This term was coined by Bell (1984) to cover a wide variety of partner-specific influences on speaking, including "all a person's attributes, psychological and social, permanent and temporary" (p. 169). Here we use it in the sense of being responsive to a partner's needs at a particular point in the conversation.

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