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Brief article

Inner speech slips exhibit lexical bias, but not the phonemic similarity effect ☆

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Abstract

Inner speech, that little voice that people often hear inside their heads while thinking, is a form of mental imagery. The properties of inner speech errors can be used to investigate the nature of inner speech, just as overt slips are informative about overt speech production. Overt slips tend to create words (*lexical bias*) and involve similar exchanging phonemes (*phonemic similarity effect*). We examined these effects in inner and overt speech via a tongue-twister recitation task. While lexical bias was present in both inner and overt speech errors, the phonemic similarity effect was evident only for overt errors, producing a significant overtness by similarity interaction. We propose that inner speech is impoverished at lower (featural) levels, but robust at higher (phonemic) levels.

Keywords: Inner speech; Internal speech; Speech errors; Inner speech errors; Lexical bias; Phonemic similarity; SLIP procedure; Tongue-twisters; Imagery; Verbal imagery; Speech imagery; Articulatory imagery; Articulatory loop; Spreading activation; Speech production; Articulatory features

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1. Introduction

Most people hear a little voice inside their head when thinking, reading, writing, and remembering. This voice is inner or internal speech, mental imagery that is generated by the speech production system (Sokolov, 1972). Inner speech is the basis of rehearsal in short-term memory (e.g. Baddeley, Thomson, & Buchanan, 1975) and some phonological influences in reading and writing (e.g. Hotopf, 1980). It may even play a role in auditory hallucinations in schizophrenia (e.g. Ford & Mathalon, 2004).

We produce inner speech the same way that we speak, except that articulation is not present (Levelt, Roelofs, & Meyer, 1999). We hear the speech in our mind, though, through an *inner loop* that transmits the speech plan at the phonetic (e.g. Levelt, 1983, 1989) and/or phonological (e.g. Wheeldon & Levelt, 1995) level to the speech comprehension system. The existence of this inner loop gives a good account of our ability to monitor our planned speech for errors (Hartsuiker & Kolk, 2001; Postma, 2000; Roelofs, 2004; Slevc & Ferreira, 2006).

Inner speech is characterized by slips of the "tongue" that can be internally "heard", despite the absence of sound or significant movements of the articulators (Hockett, 1967). Inner slips that are reported during the internal recitation of tongue twisters are similar to overt errors made when the same material is spoken aloud (Dell & Repka, 1992; Postma & Noordanus, 1996). This fact alone makes credible the view that overt errors are not really slips of the tongue. Rather, they are slips of speech planning, a process that occurs both during inner and overt speech.

The properties of inner slips can be used to investigate inner speech, just as overt slips are informative about overt production. Here, we compare inner and overt errors to investigate the processing levels in production and how these differ between inner and overt speech. The phenomena that we are concerned with are the *lexical bias* and *phonemic similarity* effects. Lexical bias is the tendency for phonological errors to create words (e.g. REEF LEECH → LEAF REACH) over nonwords (e.g. WREATH LEAGUE → LEATH REEG) (Baars, Motley, & MacKay, 1975; Costa, Roelstraete, & Hartsuiker, 2006; Dell, 1986, 1990; Humphreys, 2002; Hartsuiker, Corley, & Martensen, 2005, 2006; Nooteboom, 2005a). This effect has been attributed to either the interactive flow of activation between lexical and phonological levels (Dell, 1986) or a prearticulatory editorial process that suppresses nonword utterances (Baars et al., 1975; Levelt et al., 1999). The phonemic similarity effect is a tendency for similar phonemes to interact in slips. For example, the likelihood of REEF LEECH slipping to LEAF REACH is greater than that of REEF BEECH slipping to BEEF REACH, because /r/ is more similar to /l/ than it is to /b/. This effect has often been demonstrated in natural error analyses (MacKay, 1970; Shattuck-Hufnagel & Klatt, 1979) and in at least one experimental manipulation (Nooteboom, 2005b). Explanations for the effect posit a role for sub-phonemic features in the relevant representations (e.g. Dell, 1986).

We use the lexical bias and phonemic similarity effects to probe inner speech. Will inner slips exhibit these effects and, if so, how will they compare in magnitude to the effects in overt speech? There are three possibilities: