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The on-line “perceptual chunking” of speech: ERP evidence.

Abstract

Speech can bear two types of prosodic marks: expressive and structural. Some structural marks like lengthenings create temporal groups which appear to be universal. These marks also arise spontaneously in recall tasks: for instance, in reciting lists of digits or nonsense syllables, speakers generally create temporal groups marked by delays or final lengthening. Such grouping is not unique to speech and has been associated with a domain-general process of chunking which occurs typically in sequence learning by humans as well as animals (Terrace, 2001). Hence, this type of grouping or chunking is not bound to the content of verbal items (contra Miller, 1956). It has also been suggested that the speech stream may be perceptually chunked on-line in terms of these temporal groups (Boucher, 2006). Our present study examines this idea using Event-Related Potentials (ERPs). The hypothesis was that, if listeners chunk speech in temporal groups, then group-final marks would trigger a positive shift in an otherwise raising negativity, and this would apply regardless of whether heard speech contains meaningful or meaningless verbal items. We expected that the ERP pattern would be similar to the “Closure Positive Shift” (CPS), which has been associated with intonation phrasing (among other variables; see Steinhauer et al. 1999; Pannekamp et al. 2005).

To test our hypothesis, we conducted two experiments using meaningful utterances (Experiment 1) and series of nonsense syllables (Experiment 2). All of the contexts contained two temporal groups placed within an intonation group marked by a pitch contour. The averaged potentials show that a positive shift is specifically evoked by temporal groups in both experiments, confirming that the ERPs link to perceived prosodic groups and not to semantic- syntactic units. The results bear implications with regard to the issue of the “perceptual chunking” of speech. Historically, work on the chunking of heard verbal material has involved recall, which may not capture how listeners chunk speech on-line. Consequently, this study is the first to demonstrate an “input chunking” of speech that conforms to grouping effects on list recall and the focus of attention (Cowan 2000).

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