# Processing of Syntactic Prosody following Left versus Right Hemisphere Lesions: A Tale of Two Cases

## Introduction

Lesion studies have reported results that were sometimes supportive of the overwhelming role of the right hemisphere and at other times emphasizing the role of left hemisphere (Paulmann, 2016). Subsequently, attempts were made to resolve such contradictory findings by the formulation of Cue or Physical Feature Dependent Hypothesis (Van Lancker & Sidtis, 1992; Sidtis & Van Lancker Sidtis, 2003). According to this hypothesis the right hemisphere is adept in processing pitch and the left hemisphere in processing duration and intensity features of prosody. In contradistinction to the feature dependent hypothesis (FDH) several clinical studies found prosodic disorders in cases with lesions in basal ganglia structures that lead to the formulation of basal ganglia mediation hypothesis (BMH) of linguistic prosody (Paulmann, Pell, & Kotz, 2009).

The present study, a retrospective one, reports on deficits in processing linguistic prosody in two aphasic patients. The FDH will predict that lesions anywhere in the extensive neural network sub-serving prosody that are distributed in both hemispheres can produce deficits in processing syntactic/linguistic prosody. From the BMH point of view, a lesion in basal ganglia is critical for the occurrence of processing deficits. The data obtained from these two cases are discussed in the context of FDH and BMH, as well as, more recent neuroimaging studies of processing of syntactic prosody.

## Method

### Subjects.

Subject 1. SE, a 69-year-old right-handed female with symptoms of nonfluent aphasia and apraxia of speech related to subcortical lesions in the caudate and putamen of the right hemisphere. Subject 2. LK, a 45-year-old male with a lesion in temporal region extending up to a portion of the frontal lobe and the basal ganglia of the LH, with the symptoms of nonfluent aphasia.

### Materials

Clinical tests: Boston diagnostic aphasia examination, and Discourse comprehension test

Experimental test: A set of 10 sentences with surface structure ambiguity, that is, sentences with identical words but differ in their prosodic patterns (pauses, stress, length and pitch) that conveyed distinct meanings. For example, the sentence 'The man speaks to the woman in tears' can be presented with two distinct prosodic patterns. For each such sentence four pictures were drawn: two related to the targeted meanings, one semantically related and the other not related in any way to the target meanings. The stimulus sentences were acoustically analyzed for their pitch patterns, pauses, length and stress.

### Procedure

Each subject was tested using a sentence-picture matching task. Only correct sentence-picture matching response for a given prosodic pattern was given credit and the maximum possible score was 20.

## Results and Discussion

Both LK and SE have performed at 20% accuracy level in processing the syntactic prosody. The FDH can account for the results based on the fact that the stimulus sentences were characterized my multiple acoustic prosodic cues and LK and SE might have encountered problems in processing specific but different cues. On the other hand, the comparable deficits in both LK's and SE's performance might be related to the basal ganglia lesions shared by both, supporting BMH.

## References


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