Summary of Proposal

This study examined the left hemisphere contribution to the production of linguistic prosody that conveyed lexical stress differences and the location of syntactic boundaries within sentences. A previous study (Walker, Pelletier, & Reif, 2004) revealed that control and subjects with right hemisphere damage (RHD) conveyed similar prosodic cues to convey lexical stress differences and the location of syntactic boundaries. Further, listeners were able to perceive the acoustic cues that conveyed the different linguistic meanings. One question addressed in this study concerned the acoustic features of the prosodic structures produced by LHD subjects. Three acoustic components of prosodic structures (i.e. F0, duration and amplitude) were analyzed in two different linguistic contexts. The other question addressed the degree to which the LHD subjects were capable of conveying different linguistic meanings of prosodic structures through a perceptual analysis of their productions by normal listeners even if the structures did not contain the same acoustic cues as the control subjects.

Experiment 1

The first experiment involved the production of lexical stress differences. Nine LHD subjects and nine control subjects with no history of neurological damage participated in this study. Ten pairs of two syllable words from Walker, Daigle & Buzzard (2002) containing stress on either the first syllable (e.g., COMbine) to convey a

noun or the second syllable (e.g., comBINE) to convey a verb were utilized in this experiment. Subjects were presented with individual written words and corresponding pictures depicting the correct meanings and told to read each word aloud. The words were recorded and digitized. Three acoustic parameters of each of the paired words were measured: the average duration, average F0 and average amplitude of the first and second syllables

Preliminary findings from the analyses of the acoustic characteristics of the lexical stress pairs indicated that the control group produced lexical stress variations that were appropriate to convey differences between nouns and verbs. Nouns had longer (x = 400 ms), higher (x = 150 Hz) and louder (x = 59 dB) first syllables than second syllables (x = 285 ms, 130 Hz, 51 dB) and verbs had longer (x = 715 ms), higher (x = 160 Hz) and louder (x = 57 dB) second syllables than first syllables (x = 656 ms, 121 Hz, 54 dB). The productions of the LHD group differed from the control group. Nouns had higher (x = 142 Hz) and louder (x = 59 dB) first syllables than second syllables (x = 128 Hz, 51 dB) and verbs had longer (x = 487 ms) second syllables than first syllables (x = 238 ms). However, the duration pattern for nouns was different in that the second syllable of nouns was longer (x = 461 ms) than the first syllable (x = 266). Further, the F0 and amplitude of verbs were different as the first syllable of verbs was higher (x = 148 ms) and louder (x = 59 dB) than the second syllable (x = 127 Hz, 52 dB).

Experiment 2

The second experiment involved the production of prosodic structures that determined the location of syntactic boundaries. Five sentence pairs from Walker, Daigle & Buzzard (2002) were utilized in this experiment. The sentence pairs contained identical segmental information but could be parsed as either compound noun (e.g., The father said, listen to the choirboy) or tag (e.g., The father said, listen to the choir, boy) constructions depending on the location of prosodic boundaries. Subjects were presented with written sentences accompanied by pictures depicting the correct meaning and told to read each sentence aloud. The recording and measurement procedures were the same as in experiment 1. However in this experiment, four acoustic parameters were measured: the average duration, average F0 and average amplitude of the syllables preceding and following syntactic junctures and the average duration of pauses located at syntactic junctures.

Preliminary acoustic findings indicated that for the tag constructions, the control group produced longer durations of syllables preceding syntactic junctures (x = 647 ms), longer pause durations (x = 142 ms) and greater amplitude (x = 61 dB)) of syllables following syntactic junctures in tag constructions compared to compound nouns. Whereas, the LHD group produced similar duration, F0 and amplitude patterns for both syllables of compound noun and tag constructions and only a small pause (x = 49 ms) at the syntactic juncture of the tag construction.

Discussion

Preliminary findings indicated that the LHD group did not produce similar acoustic patterns to that of the control group to convey lexical stress differences and to denote syntactic boundaries in tag constructions. The control group produced higher, louder and longer first syllables of nouns and second syllables of verbs in two syllable words. The LHD group did not produce all of the acoustic variations that were present in the productions of the control group to convey lexical stress differences where F0 and amplitude were greater in the first syllables compared to second syllables of nouns and duration was greater in the second syllables compared to first syllables of verbs. Further, the control group produced pre-pausal syllable lengthening followed by a pause and greater amplitude on the syllables following the syntactic juncture to denote a syntactic boundary in tag constructions compared to compound nouns. However, the LHD produced similar acoustic patterns for syllables within the compound noun and tag constructions. The productions of both groups will be played for normal listeners to determine if the acoustic cues that were present in the productions of both groups are adequate for listeners to identify compound noun versus tag constructions and nouns versus verbs. These preliminary results suggest that the left hemisphere plays a role in the production of linguistic prosody and left hemisphere damage may contribute to prosodic deficits in conveying word meaning and denoting syntactic constituents.

References

Walker, J. P., & Daigle, T. & Buzzard, M. (2002). Hemispheric specialization in processing prosodic structures: Re-visited. *Aphasiology, 16 (12)*, 1155-1172.

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