A Comparative Study of Speech Motor Programming in Stutterers and Non-stutterers

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Abstract: The present study was undertaken to verify the credibility of theories that attribute the locus of stuttering etiology to be a central speech planning dysfunction. Ten adult stutterers and ten adult non-stutterers participated in this study which utilized a choice reaction paradigm to determine the effects of three independent variables, viz:- word length, Phonetic and linguistic complexity:- on the dependent variable Speech Reaction Time (SRT). By varying the response complexity in this manner it was intended to manipulate the response preparation a way that if stuttering depends on the pre-motor programming, then the response complexity would adversely affect response preparation time and this affect of "complexity" would be greater for stutterers (with aberrant speech programming) than for non-stutterers. Significant differences were elicited in both within and across group conditions and SRT's of stutterers were longer than non-stutterers. The results supported the notion that stuttering is a central speech planning dysfunction. Also, it suggest that the stutterers may be endowed with inefficient motor programming capabilities that are aggravated by increased production demands especially under time stress conditions.

INTRODUCTION

Researchers are in agreement that perturbation during preparation of the articulatory program underscores the manifestation of a stuttering event (1). These perturbations or encoding errors (2) are detected by an internal monitor and then subjected to covert/overt self repairs. While covert repairs increases response preparation time, overt repairs may be manifested as a clinical stuttering event. Assuming that the stutterer’s speech motor planning is error prone, they would require more time for accurate covert and overt repairs. Eliciting speech reaction time is one of the several means to test speech motor planning. With this, the present study aimed at verifying the credibility of theories which consider stuttering as a resultant of speech motor planning. Specifically, a choice reaction time paradigm was used to determine the effects of three independent variables, viz:- word length, phonetic complexity and linguistic complexity on the dependent variable Speech Reaction Time (SRT). It was hypothesized that, if stuttering depends on speech motor programming, then the differences in reaction time between stutterers and non-stutterers would be greater when longer and more complex stimuli are used. Also a proportional increase in the frequency of stuttering events would be evidenced.

MATERIAL AND METHOD

Subjects: Ten adult Kannada* speaking male stutterers (18-40 years, with a mean age=23.7) and Ten adult Kannada speaking male non-stutterers (16-38 years, with a mean age=21.6) with no history of any visual, hearing or neuromotor disorders served as subjects. (* Kannada is a Dravidian language spoken by the people of Karnataka.)

Material: 36 meaningful Kannada words varying in word length (9 monosyllabic, 9 bisyllabic, 9 trisyllabic, 9 multisyllabic) at three phonetic complexity levels (Complexity A :- words with phonemes b, t, k, m, l, n, g, Complexity B:- words with phonemes dz, s, r, l, Complexity C :- words with clusters sk, sl, bl, kr, bhr, gr, pr), three standard three word sentences and three picture sentences (linguistic complexity) written each on a card formed the test material. The picture sentences consisted of the sentence represented in a pictorial form.

Procedure: The subjects were tested individually in a sound treated room. Each stimulus card was slid in to the slot of a machine and was visually presented. The subjects were instructed to utter the visually presented word as quick as possible in to a microphone (D 1000) kept at a distance of 10 cm from the mouth. The cards were randomized and presented five times each. Thus each subject uttered 180 words (9 words * four word lengths * five times) and 15 sentences and 15 picture sentences. A total of 1800 word responses and 300 sentence responses were obtained from stutterers and non-stutterers each. The noise of the card slide and the subject’s utterances were audio-recorded in to a
Sony Tape Deck. This was then line fed in to the DSP Sonograph 5500. Only the fluent words were analyzed. Speech Reaction Time (SRT- Dependent variable) was measured as the time difference between the onset of the impulse noise (generated by the card fall) and the onset of the speech on the wave form display of the DSP Sonograph.

Analysis: Within and across group comparisons were carried out using one factor analysis of variance (with and without repeated measures respectively) and was followed by a Fishers PLSD post hoc test to identify the locus of significant difference between the means. Further to study the linguistic complexity variable, within and across group comparisons for standard and picture sentences were carried out using a paired and unpaired t-test respectively.

RESULTS

Significant difference between SRTs of stutterers and non-stutterers were obtained with longer SRTs in stutterers. Further SRTs and stuttering events increased with an increase in word length and word complexity for stutterers. A similar significant difference effect was observed for the standard and picture sentences for both within and between group conditions. Figure 1 shows the SRTs of stutterers and non-stutterers.

DISCUSSION AND CONCLUSIONS

A definite tendency for stutterers SRT and dysfluencies to be greater under conditions of increased word length, phonetic and linguistic complexity suggests that stutterers may be endowed with inefficient motor programming capabilities that are aggravated by increased production demands especially under time stress conditions. This supports the notion that the locus of stuttering lie in the central speech planning.

REFERENCES
