

# A STUDY OF THE EFFECTS OF POSITIONING ON VOICE AND SPEECH PRODUCTION IN YOUNG CEREBRAL PALSIED CHILDREN

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## ABSTRACT

*The effect of reflex inhibiting postures (R.I.P.) on voice production of six spastic cerebral palsied children was examined. Voice samples made before and after the utilization of R.I.P. indicated that the procedure had a positive effect on the subjects' voices, particularly in the areas of frequency and intensity. Voice change was determined by ratings of a panel of speech clinicians as well as by measurements from a visicorder oscilloscope.*

## INTRODUCTION

Reflex inhibiting postures (R.I.P.) are considered to have a positive effect on voice and speech production of children with cerebral palsy. (Crickmay 1972).

Crickmay explains the effect of R.I.P. as follows:

“When he (the child) is fully adjusted to these ‘reflex inhibiting postures’, his respiratory musculature, free from spasticity, begins to work normally. As a result, he produces a greater volume of air, with a consequent strengthening of vocal tone.”

Marland (1953), reports “in R.I.P., grimacing and drooling improve and babbling noises and simple words appear”. She goes on to say that “the R.I.P. eases production of phonation and therefore improves inflections and articulation”.

To this point, judgments have been made purely on the basis of subjective listening since instrumental calibration of voice parameters is not readily available in most clinical settings. The intent of this study is twofold. Firstly, to evaluate the effect of R.I.P. on the voice of children with cerebral palsy and secondly, to compare subjective auditory evaluations with instrumental readings using a visicorder.

## PROCEDURES

The study included six severely handicapped spastic quadriplegic children with cerebral palsy, ranging in age from one year, four months (1:4) to five years, eleven months (5:11). All of the subjects were involved in multidisciplinary treatment programs (See Table 1).

TABLE 1  
CHILDREN BY AGE AND SEX

| Name | Sex    | Age              |
|------|--------|------------------|
| A    | FEMALE | 1 yr. 4 months   |
| B    | FEMALE | 2 yrs. 2 months  |
| C    | MALE   | 4 yrs. 9 months  |
| D    | MALE   | 3 yrs. 1 month   |
| E    | FEMALE | 3 yrs. 2 months  |
| F    | FEMALE | 5 yrs. 11 months |

Prior to positioning, a sample of each child's vocalizations was tape recorded, using a Tandberg Model 12-41 at a speed of  $7\frac{1}{2}$  i.p.s. A fixed procedure was used for all tape recordings. Taping was done in a reasonably quiet and nondistracting environment. The Tandberg TM3 microphone was positioned six inches from the child's mouth with the volume set at 6. Within the same hour, the child was established in an appropriate R.I.P. and a second sample of his vocalization was recorded using the same procedure. Where possible, identical passages were recorded in both trials. For the infants, any vocalizations were accepted and recorded. Apart from the maintenance of R.I.P., no physical prompting or facilitation techniques were used during recordings. The children were not informed of the actual purpose of the two trials.

An edited version of the master tape was played to the listening panel of speech clinicians. This was necessary because each child was identified by name and position at the beginning of each sample to avoid possible error. Although each subject's trials were in apposition, the pattern of presentation to the listeners was randomized to avoid a position effect (i.e. if pre-R.I.P. trial = A and post R.I.P. trial = B, subject 1 was presented AB, subject 2 BA, subject 3 BA, etc).

## EVALUATION

### Listening Panel

Prior to the evaluations of the samples, a panel of six clinicians listened to a practice tape, Wilson (1977), and profiled the voices according to the Voice Profiling System. These clinicians were selected from an ongoing post-graduate voice course. Once there seemed to be general agreement regarding the method of profiling, the panel was asked to evaluate the voice samples of the children with cerebral palsy. The panel was not informed of the purpose of the study. The clinicians were instructed to make a judgment as to which recording of each child was best. In addition to this decision, they were asked to profile the voice samples, using Wilson's voice profile (1977). Many listeners spontaneously added written comments to clarify their profiles. Upon request, samples were replayed until the panel was satisfied with their evaluations. No discussion occurred between panel members during the evaluation procedures.

## EVALUATION

### Instrument

A random five second sample of vocalization was selected from each trial to obtain a visicorder tracing. The voice oscillograms were analyzed to obtain the following information:

1. fundamental frequency (average over the entire sample)
2. percentage of aponia (calculated from the number of aponic frames in each sample as defined by Neelley, 1978).

Pre and post-positioning samples were compared. These results were then compared with the panel judgments of each child.

## COMMENTS

**All comments refer to the voices following positioning, unless otherwise stated.**

In addition to the absolute judgments made by the panel, a number of comments to elaborate on their evaluations were spontaneously added. These, plus abstracts from the voice profiles themselves, are included below, since they are components of vocal production that are important but not measurable by the visicorder.

## CHILD A

The panel commented on the difficulty of evaluating the child's performance because of the lack of verbalization. Three panelists mentioned intensity improved.

## CHILD B

One panelist remarked that, although there was a definite improvement in overall performance, it was difficult to profile the change. Two panelists noted normal intensity.

## CHILD C

The panel noted that there was less tension and erratic phrasing. One panelist mentioned that "Although the voice still measured poorly (against the norm), much improvement was shown in all areas". The panel also commented that the voice intensity improved.

## CHILD D

The panel commented that there was less erratic phrasing, less breathiness and less tension. They also noted the voice was generally louder.

## CHILD E

Various comments by the panel included less breathiness, steadier voice, less audible inhalation and less stridor. One general comment was, "The voice is almost normal — sounds like a different child". The panel observed the voice was generally louder.

## CHILD F

The panel indicated that this child showed clearer articulation, less breathiness, less tension and more prolonged and controlled voicing. The panel's comments included, "louder and more normal volume".

## COMPARISON OF PANEL AND INSTRUMENT EVALUATIONS

## CHILD A

**Pitch:** According to the fundamental frequency expected for children between twelve and twenty-four months (12 - 24) (McGlone, 1966), this child's pitch rose towards the norm (from 306 cps to 399 cps) (Table 2). Panel members noted the rise in pitch on the evaluations forms.

**Periods of Aphonia:**

The machine recorded no periods of aphonia for this child. The listeners concurred.

## CHILD B

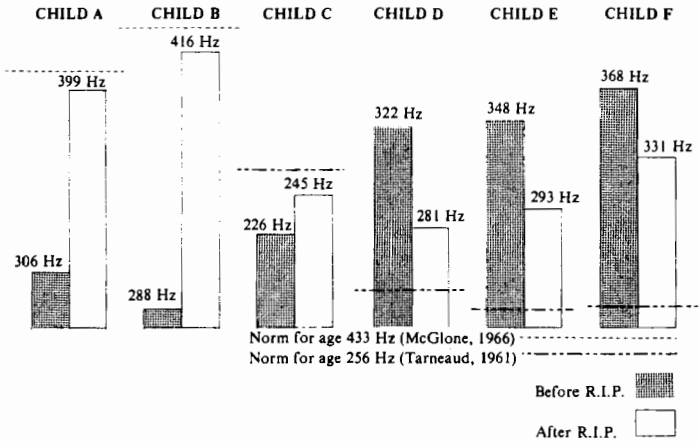
**Pitch:** The visicorder printout showed a change in pitch from 288 cps to 416 cps which is an approximation to the norm (McGlone, 1966). Three panelists remarked that the pitch rose and one noted that there was improvement even though it was difficult to be specific.

**Periods of Aphonia:**

The visicorder indicated that the percentage of aphonia decreased from 57% to 33%. There was no panel comment.

TABLE 2

MEAN FUNDAMENTAL FREQUENCY IN Hz FROM VISICORDER



CHILD C

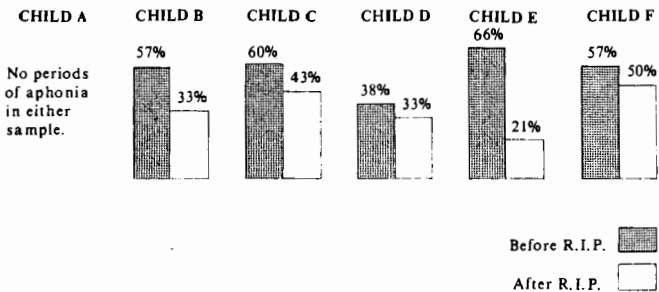
**Pitch:** The visicorder results (Table 2) show this child's voice approximated to the norm. The panel of listeners observed this change as well.

**Periods of Aphonia:**

The visicorder sample indicated that the percentage of aphonia decreased by 17% (Table 3). There was no specific panel comment.

TABLE 3

PERCENTAGE OF APHONIA FROM VISICORDER



CHILD D

**Pitch:** The visicorder results indicated the pitch fell considerably, approximating to the norm (Table 2). The listening panel commented that there were fewer pitch breaks and the vocal range was more normal.

**Periods of Aphonia:**

Although the visicorder results indicated the amount of aphonia dropped by only 5% (Table 3), the listening panel did comment that there was less aphonia.

## CHILD E

**Pitch:** The visicorder printout showed a considerable drop towards the norm (Table 2) and the panel commented that the pitch was more normal and the vocal range better.

**Periods of Aphonia:**

A dramatic decrease of 45% was measured on the visicorder printout (Table 3). The panel made no direct reference to aphonia but did comment that "the voice . . . almost normal — sounds like a different child". We feel this probably reflects the 45% change in periods of aphonia, among other things.

## CHILD F

**Pitch:** The panel and the visicorder printout concurred that pitch approximated to the norm (Table 2). The panel of listeners also observed that the vocal range was more normal.

**Periods of Aphonia:**

Although the visicorder results indicated the amount of aphonia dropped by only 7%, (Table 3), the listening panel did comment that there was less aphonia.

**SUMMARY**

This study was designed to test two suppositions:

- 1) that positioning will positively affect measurable voice parameters in cerebral palsied children, and that
- 2) these positive changes can be detected by listeners and on a visicorder printout.

As a result of placing the cerebral palsied children in reflex inhibiting postures, they were able to produce more normal voice samples. In reviewing the visicorder printout, six out of six children showed an improvement in the fundamental frequency of their voices (i.e. The pitch approximated to the norm expected for each age.) (Table 2). The periods of aphonia also decreased following positioning for five of the six children. The remaining child showed no aphonic periods in either of the two samples chosen (Table 3).

The general consensus of the panel was that the children improved after positioning (Table 4). In looking at the range of improvements in pitch and aphonia, it is interesting to note that the listeners were able to detect even the smallest changes which occurred. For example, the pitch change in Child C was only 19 Hz (from 226 Hz to 245 Hz) and in Children D and F the decrease in aphonic episodes was only 5% and 7% respectively, and yet the listeners commented on these changes.

**TABLE 4**  
**PANEL EVALUATIONS**

| Child | Panelists Recorded<br>'better' after<br>Positioning | Panelists Recorded<br>'worse' after<br>Positioning |
|-------|---|--|
| A     | 5   | 1  |
| B     | 5   | 1  |
| C     | 5   | 1  |
| D     | 5   | 1  |
| E     | 5   | 1  |
| F     | 5   | 1  |

(N.B. It was not always the same person who felt the child had not improved.)

It would appear from these data that positioning children with cerebral palsy in reflex inhibiting postures did, in fact, have a positive effect on their voice and that these positive changes can be detected by listeners and observation of visicorder printouts. In addition, the results of this study support the value of "subjective evaluation" in the treatment of children with cerebral palsy. The panel accurately reflected changes measured objectively by the visicorder. Furthermore, they were able to provide a wider range of information, all of which would be relevant to the selection of treatment goals. It would seem valid therefore, to rely on the judgments of trained listeners in the evaluation of voices of children with cerebral palsy.

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