THE EFFECT OF AUDITORY SUBLIMINAL STIMULATION ON SPELLING

by

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Abstract

The experiment investigated whether it was possible to increase the number of words spelled correctly by exposing students to those words embedded subliminally in music.

One hundred and fifty spelling words were randomly divided into fifteen lists of ten words, and each list was then rated for difficulty to obtain a difficulty factor. The students were tested on the first five lists (A-E) to establish their baseline performance. For the intervention phase, seven lists of ten words (F-L) were subliminally embedded in music which was played to the class twice during the school day. The taped music was of fifteen minutes duration and during the first day of the intervention period contained all seven lists of spelling words. After listening to the tape twice the students were tested on the words in List F.

The tape for the second intervention day had the same fifteen minutes of recorded music with the remaining six lists of ten words subliminally embedded. After two exposures to this tape the class was then tested on List G. Similarly, each succeeding tape had the previous day's list of words upon which the children had been tested removed until the seventh day's list completed the intervention period with only one list, (List L) played. Finally, a second baseline measurement was made using Lists M to O.

The results indicate that the number of words spelled correctly was increased. The results also showed there was a statistically significant difference in the average number of words spelled correctly by students in regular class when compared with students in

special class. The greatest gain in learning new words to spell by subliminal means were made by regular class students. There was no statistically significant difference between boys' and girls' results. The first statistically significant increase in spelling scores occured after 82 subliminal stimulations.

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THE EFFECT OF AUDITORY SUBLIMINAL STIMULATION ON SPELLING

CHAPTER I

We do not attend to many of the hundreds of stimuli with which we are constantly bombarded. There is ample evidence that our brain is aware of much more than what we consciously experience, and this subliminal sensory inflow is important to our brain for monitoring the external world by detecting change. Through access to previously stored information we appraise the subliminal sensory inflow for meaning (Dixon, 1981).

Subliminal, as defined by Webster's Seventh New Collegiate Dictionary (1970), means, "existing or functioning outside the area of conscious awareness", and recent literature (Key, 1973, 1976, 1980) indicates that techniques of subliminal persuasion are perhaps widespread in our society. These techniques generally consist of visual subliminal stimuli which are embedded in pictorial advertisements. A word such as SEX is etched lightly on a photoengraving plate containing an illustration, or sometimes airbrushed very lightly into a drawing or photograph which is then reproduced in the advertisement. Key, (1973, 1976, 1980) claimed in his three books that in the Western World the buyer is bombarded constantly in the mass media, both visually and aurally, by subliminal messages, which stimulate him to buy, or make use of particular merchandise. Many examples of visual subliminal messages are given, but he quoted few which concern auditory subliminal use.

Key demonstrated how some advertisers try to manipulate and direct the public's buying behaviour through the use of visual subliminal implants in advertisements. Each book contains samples of illustrations used in advertisements with the visual subliminal embedments enlarged for easier recognition. While his work is descriptive, Key has gathered data from many sources. Besides the examples of visual subliminal implants, Key cited how in the film The Exorcist, while subliminal deathmask apparitions were flashed upon the screen, frightening sounds were added to the soundtrack to increase the film's frightening effect. Brief mention is also made of auditory subliminal messages placed in musical recordings to heighten the emotional content. Probably the most interesting example of auditory subliminal use is Key's (1980) claim that a Dr. Hal Becker has reduced shoplifting in six large stores 37 percent simply by inserting subliminal messages such as, "I am honest, I will not steal. Stealing is dishonest," masked by the music which was played through the stores' public address system, and recorded 30 to 40 decibels lower than the music (Key, 1980, p. 98). It would appear that auditory subliminal messages have an effect, and it would be feasible to investigate the use of auditory subliminal stimuli in routine learning such as when spelling is taught.

Students in the elementary school system customarily spend about 15 minutes daily on spelling instruction (Thomas, 1974). Researchers (Thomas, 1974, Personke & Yee, 1971) stressed the importance of the

sound-symbol or phoneme-grapheme relationship when students learn to spell new words, and Thomas in particular, emphasized that correct pronunciation of the new word is essential. While new words to be learned are customarily presented visually, an equally important part of the learning-to-spell process is auditory.

This study is designed to determine whether a learner will increase the number of words spelled correctly after being exposed to those words embedded subliminally in recorded music.

Spelling was selected for this study for two reasons. Firstly, the results could be easily determined by assessing whether or not the words were reproduced by the students exactly as they were presented subliminally. It will, however, be necessary to ensure that the spelling lists used for measuring are approximately equivalent in difficulty. Secondly, if the study was successful it could result in a substantial saving of time. For students in the elementary school the time involved in the learning of spelling words is approximately 15 minutes per day (Thomas, 1974). If spelling words could be learned by embedding auditory subliminal stimuli in music, then perhaps much of the time spent in learning to spell new words could be utilized for conscious learning in other subject areas.

The saving in time would be a major advantage to those children who experience difficulty in learning. Typically, these would be the children who are considered to be either learning disabled or

moderately mentally handicapped. The learning disabled child is defined in the B.C. Ministry of Education Special Program Policies (1981), as that child who shows a significant discrepancy between their estimated learning potential and actual performance, and the moderately mentally handicapped child is that child who generally functions two to three years below their actual age level. It is hoped then, that these children would benefit from a new or supplementary method of instruction.

Thus, the questions to be answered are:

1. Is it possible to increase the number of new words a student can spell correctly by embedding those words subliminally in music?
2. Is there a difference in the number of words spelled correctly between children assigned to regular classes and children assigned to special classes and labelled learning disabled and mentally handicapped, when both are exposed to the same auditory subliminal messages in spelling?
3. Is there a difference in the number of words spelled correctly between girls and boys who were exposed to auditory subliminal stimuli of spelling?
4. What number of subliminal exposures are required to be effective for learning to spell words?

CHAPTER II

Survey of the Literature

While there has been considerable research on the effects of subliminal stimuli, the majority of this research has focussed on visual subliminal messages. Studies on the use of auditory subliminal messages are few. Moore (1982), for example, referred to the "total absence of published studies investigating possible effects of subaudible messages" (p. 44).

Similarly, Borgeat and Goulet (1983) observed:

> "Until now, most studies in this field have concerned visual subliminal perception, while the auditory modality has not yet been much investigated" (p. 760).

Key (1973, 1976, 1980) has surveyed subliminal techniques involving mainly visual stimuli. In Media Sexploitation, this author devoted a chapter to 'Subliminal Rock' and focussed on the hidden meanings of the words used in 'rock songs'. Reference was made to a Beatles' recording of a song titled 'Strawberry Fields' where "in the last few grooves...A voice inexplicably appeared at low volume and said, 'I buried Paul'" (p. 210). While acknowledging the existence of subliminal techniques, Key, however, failed to support his theories with empirical evidence. Even when he was asked whether he had clear, specific proof that subliminals affected behaviour, he responded,

> "My answer (often unsettling to those who read my books) is that I do not. Nor do I know anyone else who has clear, specific, simplistic, demonstrable data to settle the questions once and for all" (p. 28).

Similarly, Dixon (1981) in reviewing evidence of unconscious perception, wrote,

> "Taken together the data from these various sources attest to the reality of unconscious perception and preconscious processing. They provide strong support for the notion of two systems - one for information transmission, the other for conscious experience. They suggest that sensory inflow may be subjected to successive levels of analysis and have significant effects upon many sorts of psychological functioning without ever itself being consciously represented" (p. 19).

Dixon did not categorically state that the data definitely indicated two systems within the brain, but rather they "indicate strong support", "suggest that", and "may be...".

It is generally understood that we learn mostly through our five senses, but research in recent years has shown that our brain is aware of stimuli which fall outside the range of our conscious perception. For example, Dixon (1981) reported that Greer, (1977) "found in his research on motor movements that his subjects performed significantly better when receiving subliminal visual information as to the extent of the movement being made" (p. 15).

Dixon (1981) argued that within the ranges of our perception there are probably two systems operating. Firstly, there is the system of conscious experience which can operate independently, and secondly, another system which operates when "the level of stimulus energy (is) sufficiently great to activate peripheral receptors and cortical reception areas, but insufficiently intense to produce an effect in consciousness" (p. 11). In support of this statement he

cited findings from several researchers, (Lehmann, Beeler, and Fender, 1967; Cobb, Ettlinger, and Morton, 1967), involving experiments on binocular rivalry. In this area it has been found that although rivalry is characterized by the fact that information from only one eye is consciously represented at any one time, both eyes continue to provide the brain with information which is registered and analyzed. Any stimulus change available only to the non-dominant eye causes binocular rivalry and a corresponding temporary change in dominance.

Similarly, other researchers, (Poepel, 1973; Ikeda and Wright, 1974) have stated that in "blindness due to damage of the central visual pathways and in cases of amblyopia, the suppressed eye has been shown responsive to a moving stimulus in that part of the visual field for which the patients were totally blind" (p. 14).

In the area of dichotic or separate ear listening it has been found that the properties of the memory store in which unattended items were kept were those of long term memory (Martin, 1978). Martin found that unattended stimuli were not rapidly forgotten as had previously been thought, but unlike the attended stimuli were stored in long term memory.

The Poetzl effect (Dixon, 1981) further supports the notion of subliminal stimuli being stored in long term memory. "Poetzl, (1971) found that patients with lesions involving the visual areas showed a tendency towards a breakdown of what he called the normal 'abstracting process', with the result that non-consciously perceived stimuli became 'released'" (p. 21). Another researcher, Fiss (1961) found that relaxation facilitated the emergence of previous stimulus material.

Henley (1975), in examining cross-modal effects of subliminal verbal stimuli found that material in the unattended auditory channel "was analysed for meaning and was integrated with material in the attended channel when it was relevant..." (p. 30). She also found support for the delaying effect of the Poetzl phenomenon. Surprisingly, Henley (1976) was unable to show that subliminal cue words presented to one ear would influence responses to homophones presented to the other ear. However, examination of the results did show that response times were significantly faster for those words which were correctly matched, and again, when written responses were later required the delayed effect of the subliminal cues was again noted.

Research in the area of hearing (Martin, Hawryluk and Guse, 1974) has shown that when subjects were exposed to tones of high frequency which were beyond the awareness threshold, the subjects could be conditioned to show a galvanic skin response and cortical evoked potentials which signaled the arrival of the information at the cortex.

In the second part of their experiment the subjects were required to move a lever to the left when the upper of two lights flashed on, and to the right when the bottom light flashed. Unknown to the subjects, ultrasound (sound at 16,000 to 20,000 cycles per second) was paired with the top light just prior to flashing for the experimental group. The control group received no exposure to ultrasound. During this conditioning phase there was no difference in response times between the groups. However, when the reversal procedure took place

and the ultrasound was paired with the bottom light, reaction time for the experimental group was significantly faster than for the control group. This suggested that the ultrasound stimulus could "serve as a cue that has some effect on instrumental behaviour" (p. 603).

Borgeat and Goulet (1983) also attempted "to measure eventual psychophysiological changes resulting from auditory subliminal activation or deactivation suggestions" (p. 759). These suggestions were recorded at the 25 decibel level and masked with white noise recorded at the 40 decibel level. Their results showed a significant effect for activation, but not for deactivation. The suggested reason for a lack of significant deactivation was that as the subjects were already relaxed while listening to the recorded subliminal messages further significant relaxation or deactivation was not possible.

Thus it appears there is some evidence that the brain does respond to auditory stimuli of which the conscious mind is unaware.

CHAPTER III

Method

Subjects

A class of twenty-three grade five students, consisting of fourteen boys and nine girls, ranging in age from ten to thirteen years, was selected from a small town elementary school. This particular school was chosen because it contained the majority of the district's special education students and these students were integrated into the regular classes. In the class selected, there were six male students who were assigned to special class placement on a part-time basis.

Apparatus

The spelling words were selected from the level seven list compiled by Arvidson (1963). Arvidson's listing contains 2,700 words in seven levels of frequency of usage, with level seven being the words least frequently used by students in the elementary school. Arvidson's 2,700 words were selected from a list of 5,000 words compiled by the Bureau of Curriculum Research of the Board of Education of the city of New York between 1946 and 1953. Arvidson, who prepared his lists initially for New Zealand students although they are now also used by teachers in England comments,

> "The frequency levels of the chosen words, based though they were on overseas research, required very few changes to conform to the usage of New Zealand children, and indeed, this was to be expected" (p. 8).

Each of the 476 words in level seven was numbered, and then 150 were assigned to one of fifteen lists of ten words using randomization tables constructed by Kendall and Smith, (1938). The fifteen lists were then labelled List A through to List O.

Following the random assignment of words to the fifteen lists, a subsequent visual examination showed that some of the lists contained a seemingly unequal distribution of difficult spelling words. To rectify this, each word in each list was assigned a given number of points for the following characteristics.

a. the number of syllables (1 point for each)

b. the number of digraphs (sh-ch-wh, etc.) (1 point for each)

c. the number of diphthongs (ea-ai-oa, etc.) (1 point for each)

d. the number of double letters (1 point for each)

e. the number of silent letters (1 point for each)

f. irregular letter to phoneme sounds
(tion for shon, gh for f) (1 point for each)

By totalling the points for each list it was possible to make a comparison of the relative difficulty of each list and to produce an equalizing factor for each list.

The factor was derived by taking the total points (the score for difficulty) for each list, determining the average, and finding the deviation. The deviation divided by the score for each list then produced the difficulty factor. (See Table 1)

All student raw scores for each list were then multiplied by the corresponding difficulty factor to obtain adjusted scores.

Table 1

Difficulty Factor Produced by Dividing the Deviation From Average Score by the Spelling List Score for Difficulty

List	Score on Difficulty	Deviation	Factor
A	33	+5.334	+.1616
B	23	-4.666	-.2028
C	27	-0.666	-.0246
D	22	-5.666	-.2575
E	25	-2.666	-.1066
F	35	+7.334	+.2095
G	22	-5.666	-.2575
H	27	-0.666	-.0246
I	31	+3.334	+.1075
J	28	+0.334	+.0119
K	28	+0.334	+.0119
L	27	-0.666	-.0246
M	31	+3.334	+.1075
N	25	-2.666	-.1066
O	31	+3.334	+.1075

The preparation of the experimental tapes was done in the following manner. A fifteen minute selection of music from Encore (Fiedler's Greatest Hits) (Polydor, Stereo 24-5005) was recorded from a Technics SL D303 turntable, through a Realistic Stereo Disco Mixer onto a tape using a Technics RS M225 tape recorder. The spelling words were recorded monaurally on a Realistic Minisette IV recorder and played back on the same machine through a second channel of the Mixer. The volume level of the Minisette recorder was set at #5 and

the volume lever on the Mixer was set at #0.5. The mixer channel through which the music was recorded was set at #10.0. Successive attempts at calibrating indicated that these settings effectively allowed the high points on the tape containing the spelling words to be recorded at a level 30 to 40 decibels lower than the music, in accordance with Key's (1980) suggestion.

The tapes were played on a Califone tape recorder Model #3430 with the volume adjusted to #6 level, which was considered by the classroom teacher and the writer to be a comfortable level of listening. This procedure replicated the conditions under which shoppers heard background music in stores and which Key (1980) claimed to be successful in reducing shoplifting.

Design

The design of the experiment is a basic A_1-B-A_2 design (Herson and Barlow, 1976). To establish a baseline (A_1) the students were tested on the first five lists (A - E) consisting of ten spelling words each.

For the intervention (B), seven lists of ten words (Lists F - L) were subliminally embedded in music which were played to the class twice during the school day. The taped music was of fifteen minutes duration, and during the first day of the intervention period contained all seven lists of spelling words. After listening to the tape twice the students were tested on the words in List F.

The tape for the second intervention day had the same fifteen minutes of recorded music with the remaining six lists of ten words subliminally embedded. After two exposures to this tape the class was then tested on List G.

Similarly, each succeeding tape had the previous day's list of words, upon which the children had been tested, removed until the seventh day's list completed the intervention period with only one list (List L) played. Finally a second baseline measurement (A_2) was made, using Lists M - O. So that the students would be unaware of the change to baseline$_2$ conditions, the same musical excerpt without any subliminal implants was played twice each day before Lists M, N and O were tested. Schematically, the design is shown in Figure 1.

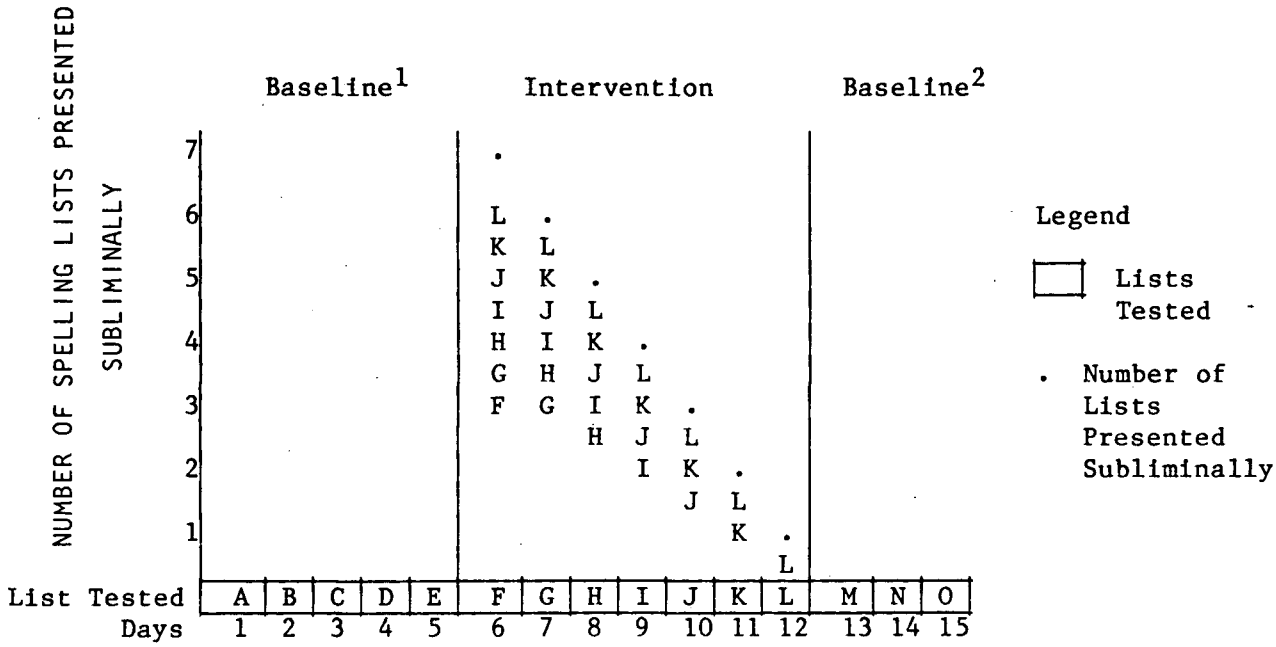

Figure 1 Number and label of spelling lists presented to students and lists tested per day and per phase.

Frequency of Exposure

The selected spelling words were recorded at an average rate of 24.5 words per minute, with the whole word being stated, followed by the word spelled letter by letter. Each tape was played twice during the day while the students were engaged in reading or writing activities at their desks.

After a tape has been played to the class the second time, the teacher then tested the class on the list of words assigned for the day. (Figure 1).

Students were exposed to tapes at varying degrees of frequency as noted in Table 2.

Table 2

Frequency of Presentation of Spelling Lists Per Day for the Intervention Phase

Name of Spelling List	Number of Days Presented	Frequency of Exposure for Each Spelling List	Total Frequency of Exposure
		1 2 3 4 5 6 7	
F	1	8	8
G	2	8 12	20
H	3	8 12 16	36
I	4	8 12 16 20	56
J	5	8 12 16 20 26	82
K	6	8 12 16 20 26 38	120
L	7	8 12 16 20 26 38 76	196
Intervention Day		1 2 3 4 5 6 7	

Duration of Experiment

It was originally planned that the experiment would take place over a period of 15 school days, but due to the realities of school operation there were many delays caused by pupil illness, sports days, school visitors, Easter holidays, unexpected school assemblies, teacher in-service days, and changes in special class timetabling. This extended the original period of three school weeks to almost eight school weeks. Thus the first phase (A_1) took place over a period of seven days, the second phase (B) over a period of thirty-seven days, and the third phase (A_2) over a period of seven days.

Analysis of Results

The words spelled by each child were checked for correctness by the experimenter. Words were not considered correct unless written exactly as spelled in Arvidson's lists. To examine whether there had been any effect by the intervention on the number of letters correctly placed, a count for each letter correctly placed in each word was done for all lists. Class, group, and individual results were graphed for easy visual presentation.

Small group results were graphed for visual comparison. Direct observation of the graphed results gave a visual indication of whether the treatment was successful in increasing the children's ability to spell the words which were presented to them subliminally.

Herson and Barlow (1976), in a chapter written by Kazdin, presented several relevant statements concerning the use of graphing the results of experimental designs. Kazdin stated firstly, that the reliability of a finding in the experimental sense, can be achieved

by replicating the baseline level of performance during the intervention, and secondly, that the typical criterion for experimental evaluation is related to the divergent slopes of baseline and treatment phases, where the emphasis is on the trends or slopes in each phase. When a baseline condition is reinstated the trend is likely to be in the opposite direction of the intervention. Lastly, he makes the point that intra-subject replication of treatment and baseline results satisfies the experimental criterion of replication without having to use the "statistical comparisons characteristic of between-group research" (p. 268). For these reasons, Kazdin rejected statistical evaluation as a (necessary) "criterion for establishing the effect of an intervention" (p. 269). The twenty-three individual student graphs give a visual indication of the effect of the intervention phase compared with the two baseline performances.

However, to determine the statistical effectiveness of the intervention phase "t" tests were calculated for the whole class between $baseline_1$ and intervention; intervention and $baseline_2$; and $baseline_1$ and $baseline_2$. Similarly, further "t" tests (between groups) were used to compare performance between regular class boys and girls; and between regular class students and special class students; for $baseline_1$, intervention, and $baseline_2$ phases.

CHAPTER IV

Results

The results of the class achievement in raw scores for all three phases and the dates on which each of the spelling lists were tested, is shown in Figure 2. Figure 3 shows the percentage of letters correctly placed in each list for all students and also uses raw scores. All following figures contain results expressed as adjusted scores, obtained by multiplying the raw score by the difficulty factor for each spelling list (Table 1).

Class achievement using adjusted scores is shown in Figure 4, with Figure 5 showing the comparison between Special Class students and the regular class students, and Figure 6 showing the comparison between boys, girls, and Special Class students.

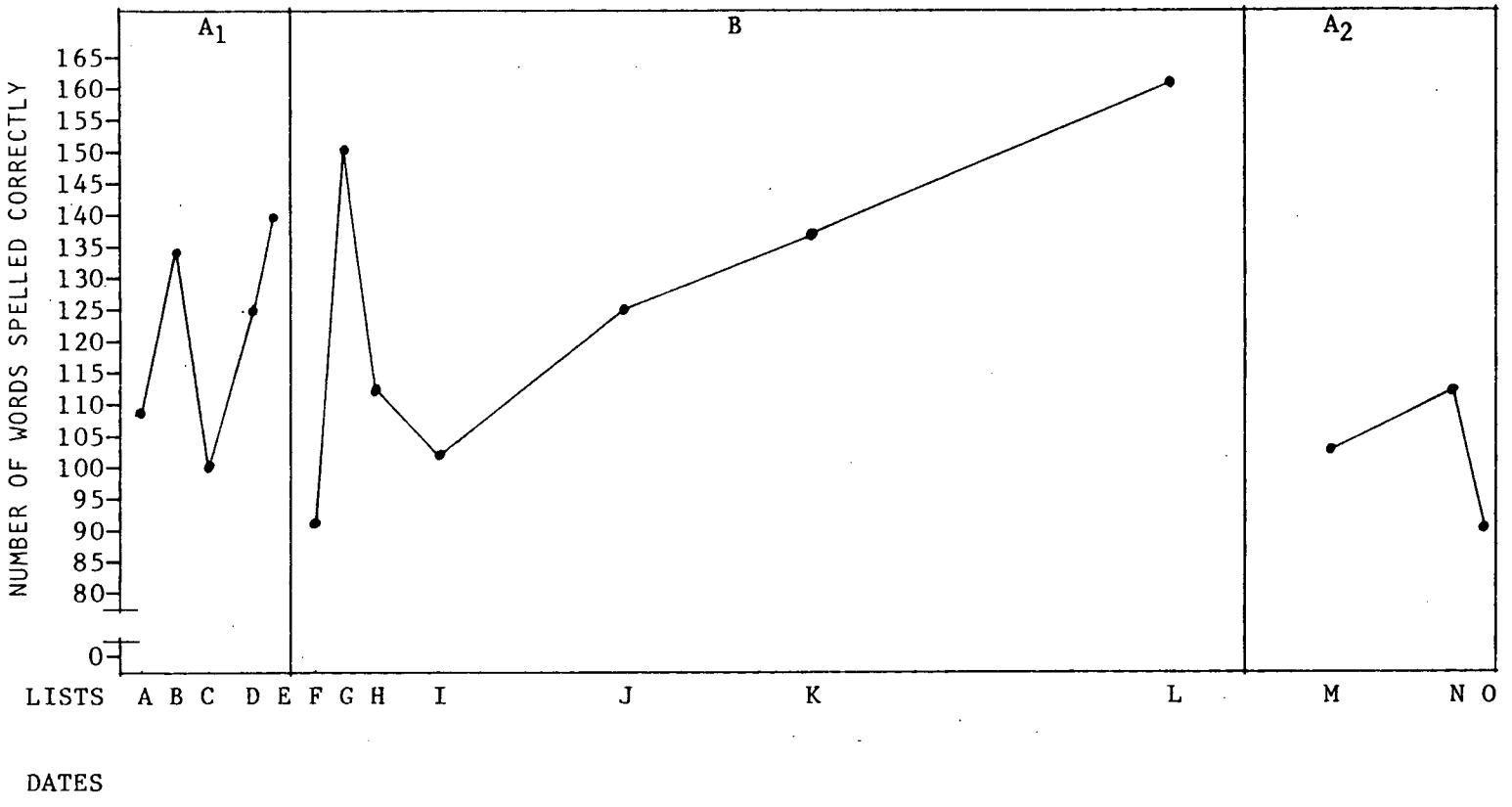

Figure 2 Number of words spelled correctly by all students for all three phases and the dates on which each of the spelling lists were tested.

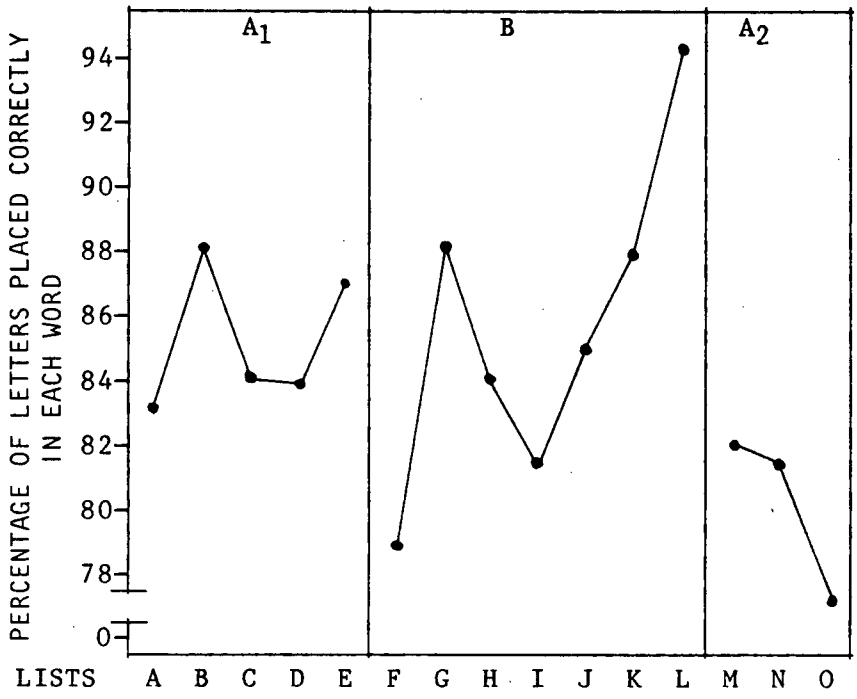

Figure 3 Percentage of letters placed correctly in each list for all students for all phases.

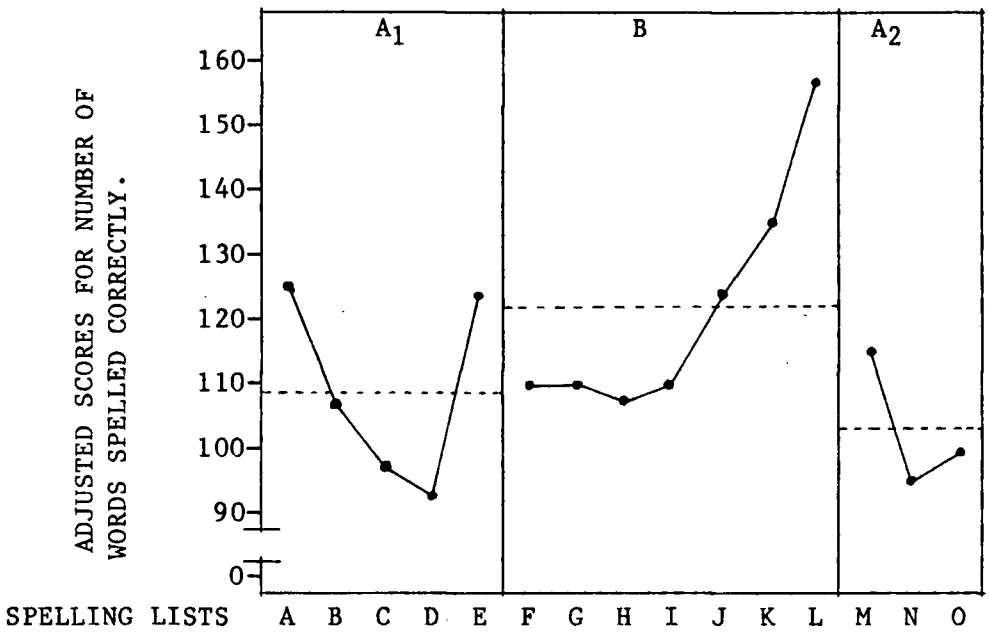

Figure 4 Adjusted scores for number of words spelled correctly by students each day, and means for baseline(A_1) intervention and baseline (A_2) phases.

Examination of Figure 3 shows the means for each phase as baseline (A_1) 109.12, intervention (B) 122.53, and baseline (A_2), as 103.5.

By comparing the means for each phase a highly statistically significant difference was found between A_1 and B ($t = 4.0749$, $p > .001$) and between B and A_2 ($t = 4.7339$, $p > .001$). There was no statistically significant difference between A_1 and A_2 ($t = 1.4501$, $p < .1$).

Analysis of the intervention phase for Figure 4 showed an increase in scores between List I and Lists J, K, and L. The increase from List I to J was statistically significant at the $p > .1$

level, while the change between the List I score to the List K score was statistically significant at $p > .05$. The increase between List I and List L was significant at $p > .001$.

As there was no statistically significant increase in the scores for Lists F to I, these scores were averaged for comparison with the average of the scores for Lists J, K, and L. This yielded a statistically significant increase ($t = 5.8514$, $p > .001$).

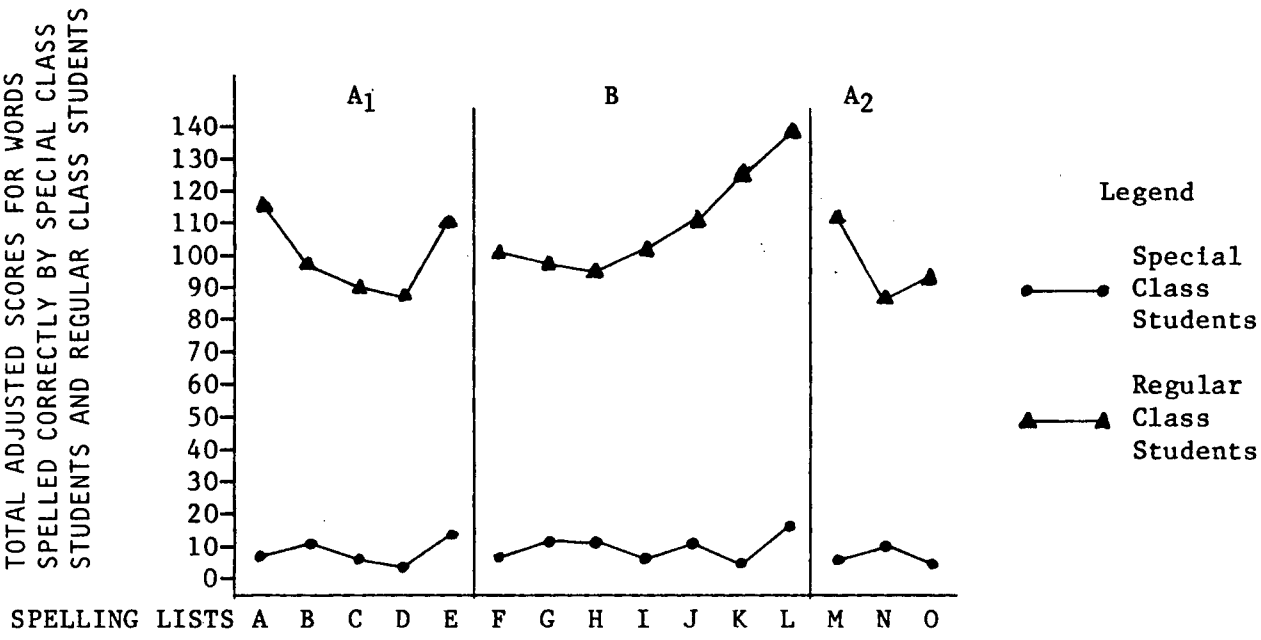

Figure 5 Total adjusted scores for number of words spelled correctly by special class students and regular class students for the three phases.

Statistical calculation shows there is a statistically significant difference between the special class students' results and the remainder of the class. When comparing the two groups on baseline A_1, $t = 5.9374$, with $p > .001$. Comparison of the intervention phases showed $t = 5.7745$, $p > .001$, and the comparison of baseline A_2 gave $t = 6.0198$, $p > .001$.

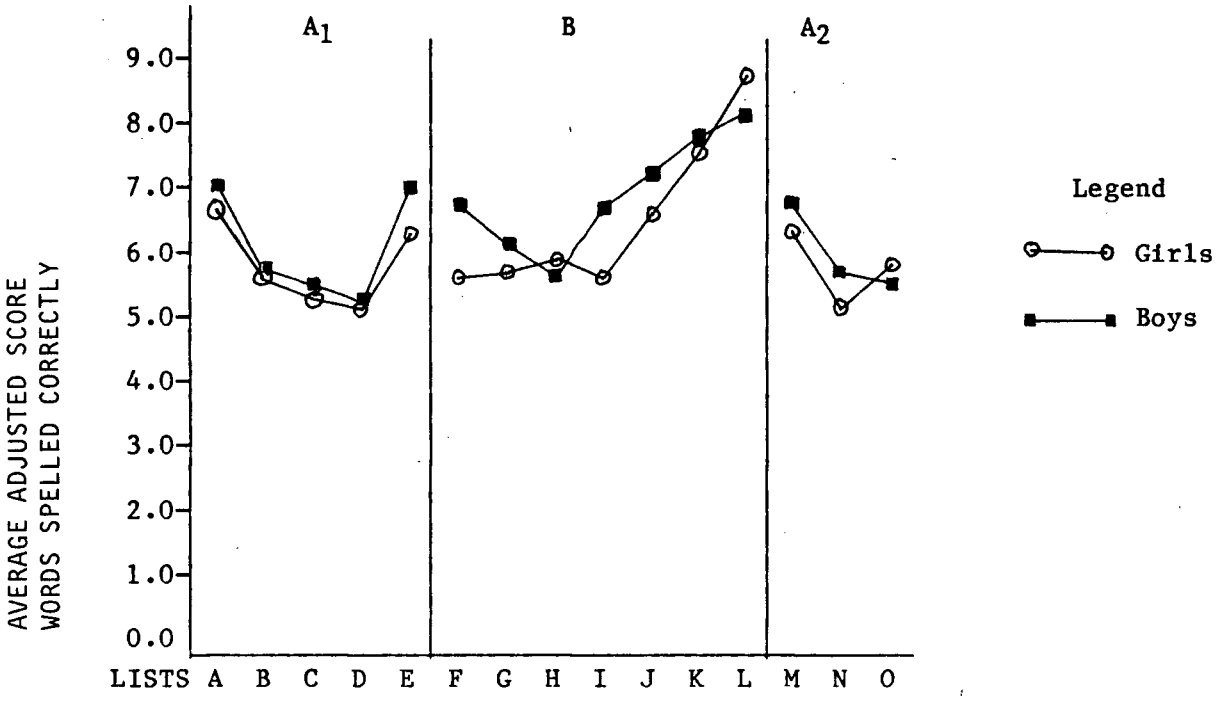

Figure 6 Average daily spelling scores for regular class girls, and regular class boys, for baseline and intervention phases.

There was no statistically significant difference between the boys' and girls' scores. Comparison of baseline (A_1) gave $t = 0.4058$, $p < .1$, intervention phase (B) gave $t = 0.6083$, $p < .1$, and baseline (A_2) gave $t = 0.3564$, $p < .1$.

The following graphs, Figures 7 to 29 illustrate individual achievement on all spelling lists throughout the three phases.

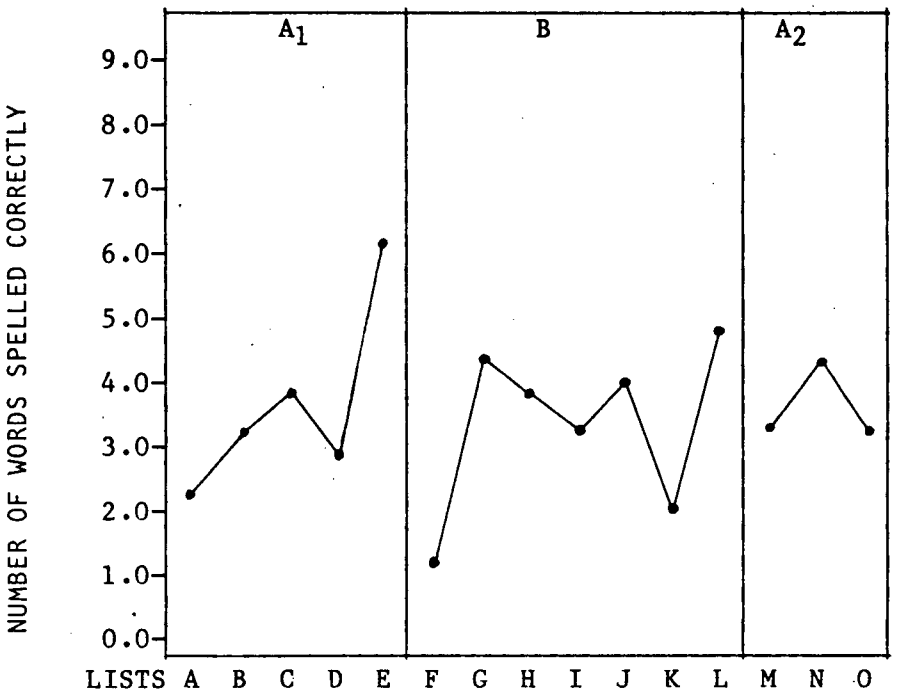

Figure 7 Number of words spelled correctly by pupil 01 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 01 was a male special class student. The mean achieved for baseline (A_1) was 3.70, for intervention phase, 3.37, and for baseline (A_2), 3.66.

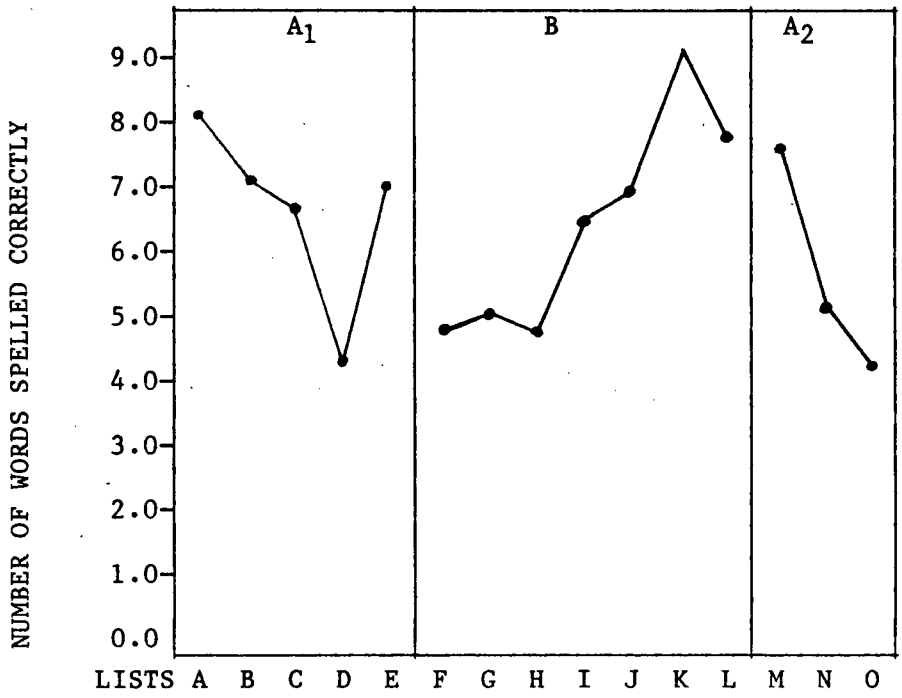

Figure 8 Number of words spelled correctly by pupil 02 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 02 was a female regular class student. The mean achieved for baseline (A_1) was 6.72, for intervention phase, 6.45, and for baseline (A_2), 5.80.

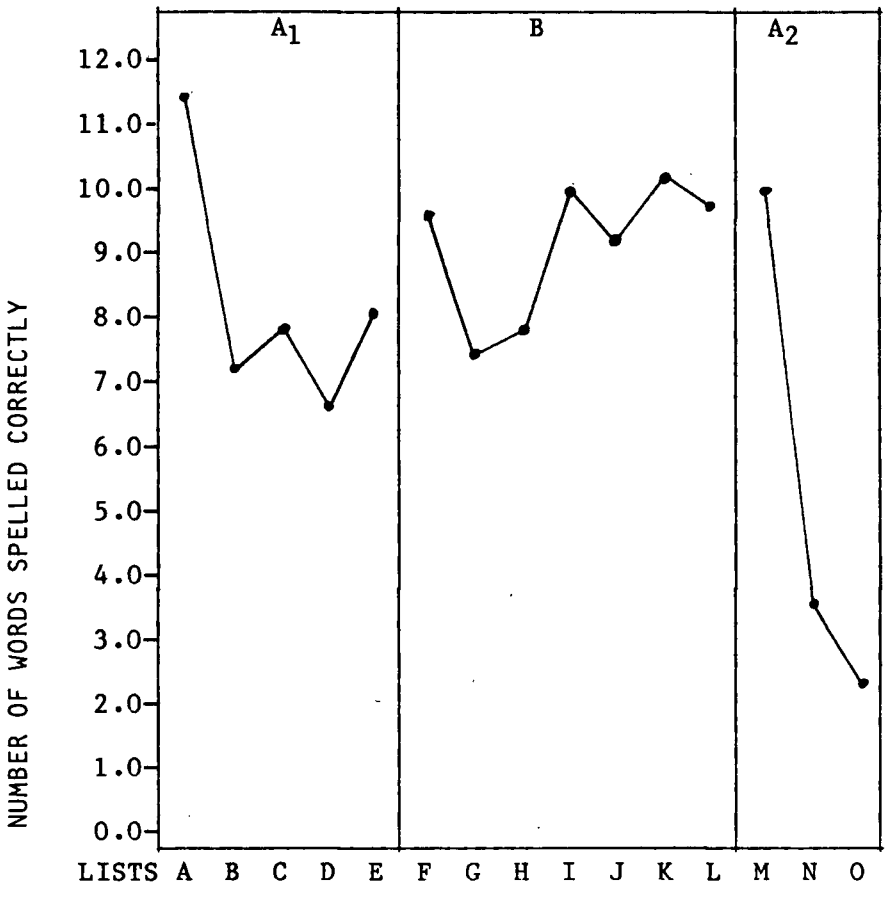

Figure 9 Number of words spelled correctly by pupil 03 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 03 was a male regular class student. The mean achieved for baseline (A_1) was 8.24, for intervention phase, 9.08, and for baseline (A_2), 5.20.

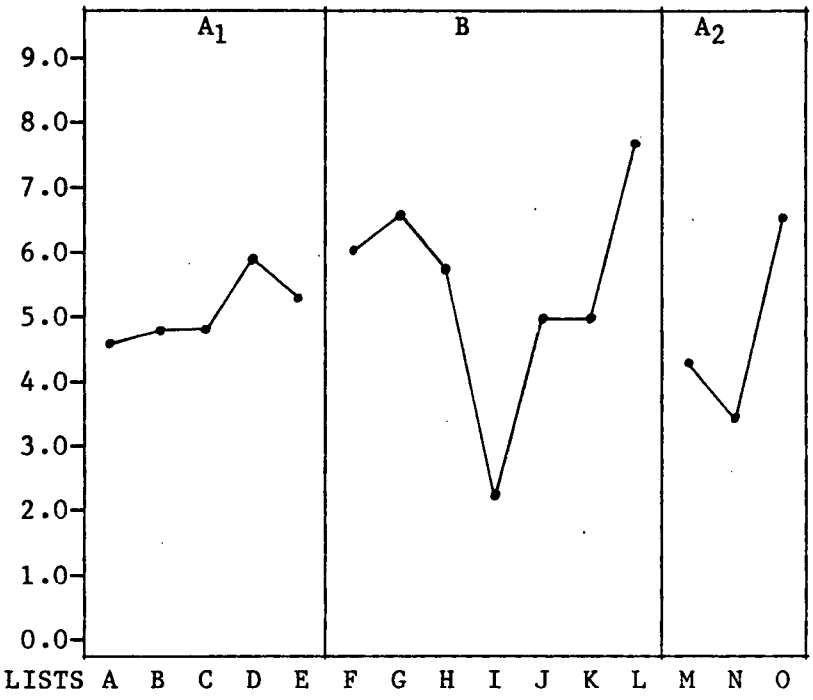

Figure 10 Number of words spelled correctly by pupil 04 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 04 was a female regular class student. The mean achieved for baseline (A_1) was 5.08, for intervention phase, 5.48, and for baseline (A_2), 4.83.

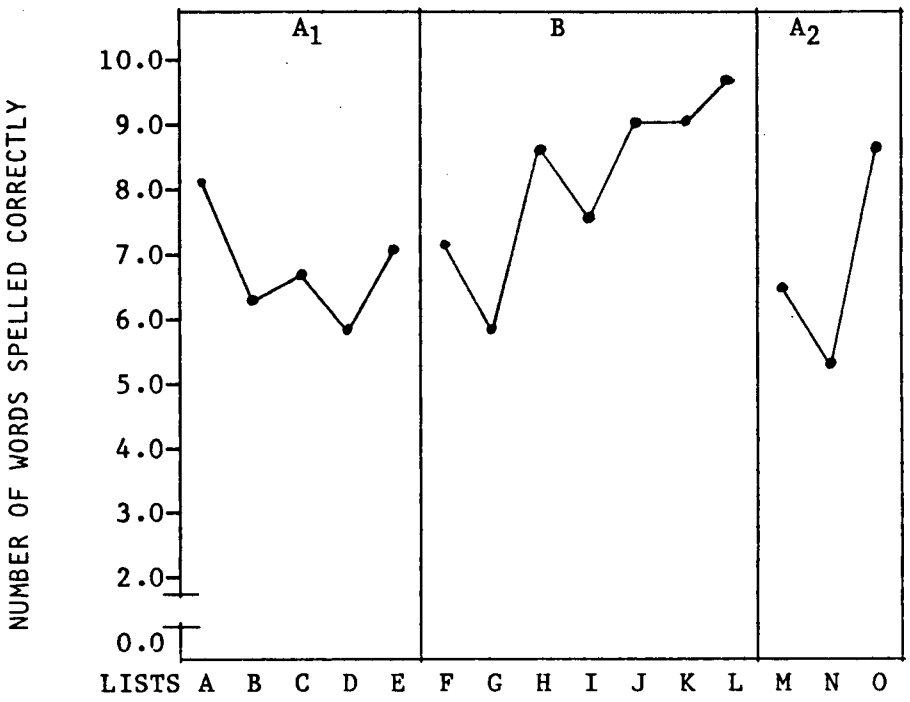

Figure 11 Number of words spelled correctly by pupil 05 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 05 was a female regular class student. The mean achieved for baseline (A_1) was 6.86, for intervention phase, 8.20, and for baseline (A_2), 4.83.

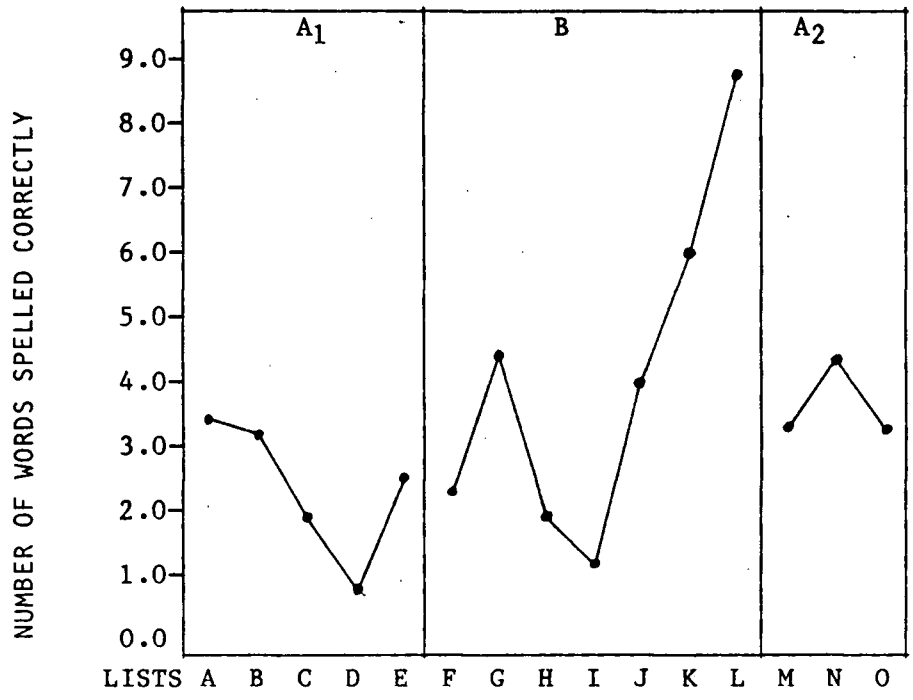

Figure 12 Number of words spelled correctly by pupil 06 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 06 was a male regular class student. The mean achieved for baseline (A_1) was 2.38, for intervention phase, 4.07, and for baseline (A_2), 3.66.

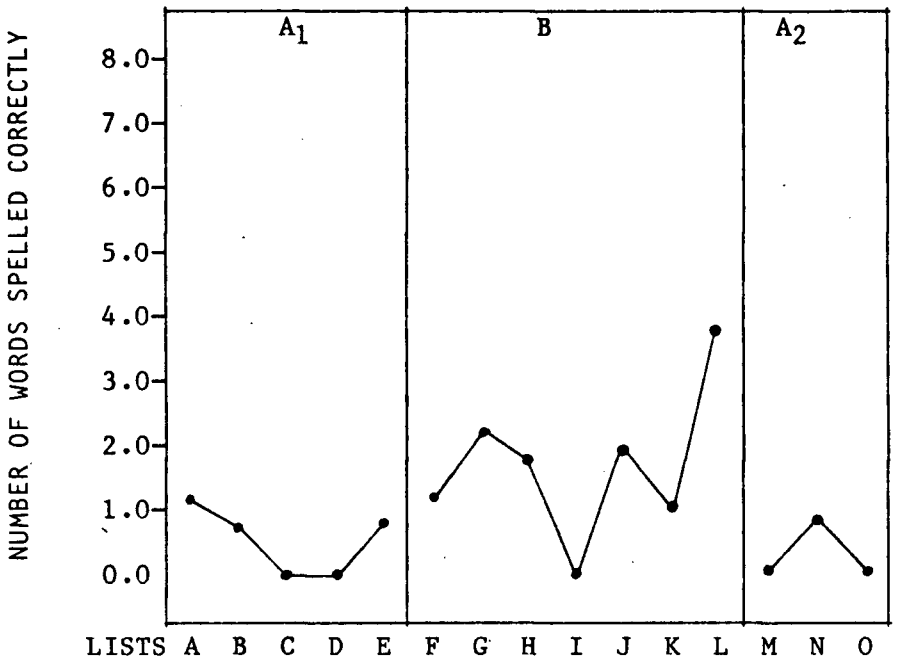

Figure 13 Number of words spelled correctly by pupil 07 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 07 was a male special class student. The mean achieved for baseline (A_1) was 0.56, for intervention phase, 1.74, and for baseline (A_2), 0.26.

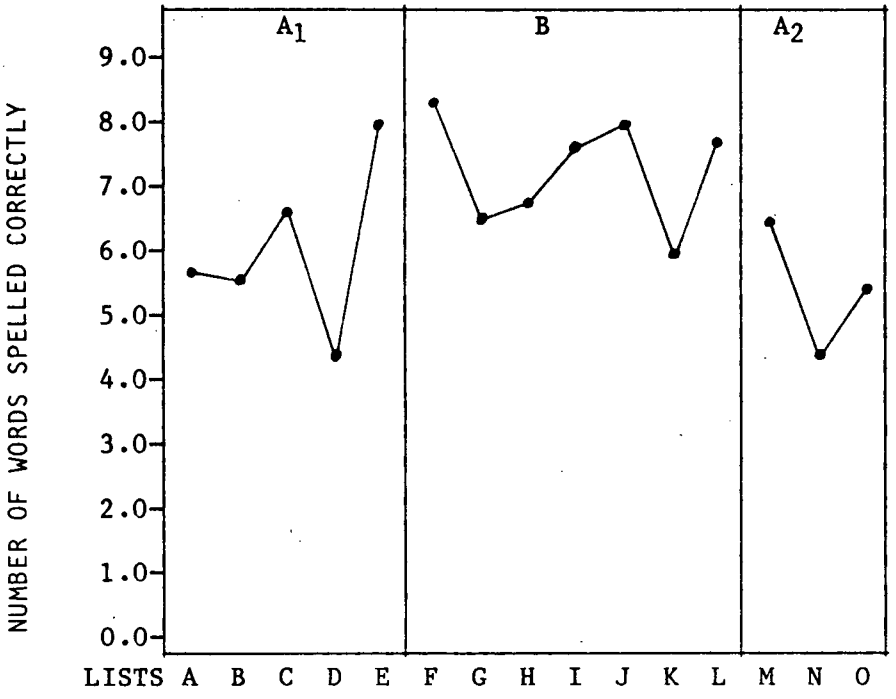

Figure 14 Number of words spelled correctly by pupil 08 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 08 was a male regular class student. The mean achieved for baseline (A_1) was 6.12, for intervention phase, 7.32, and for baseline (A_2), 5.50.

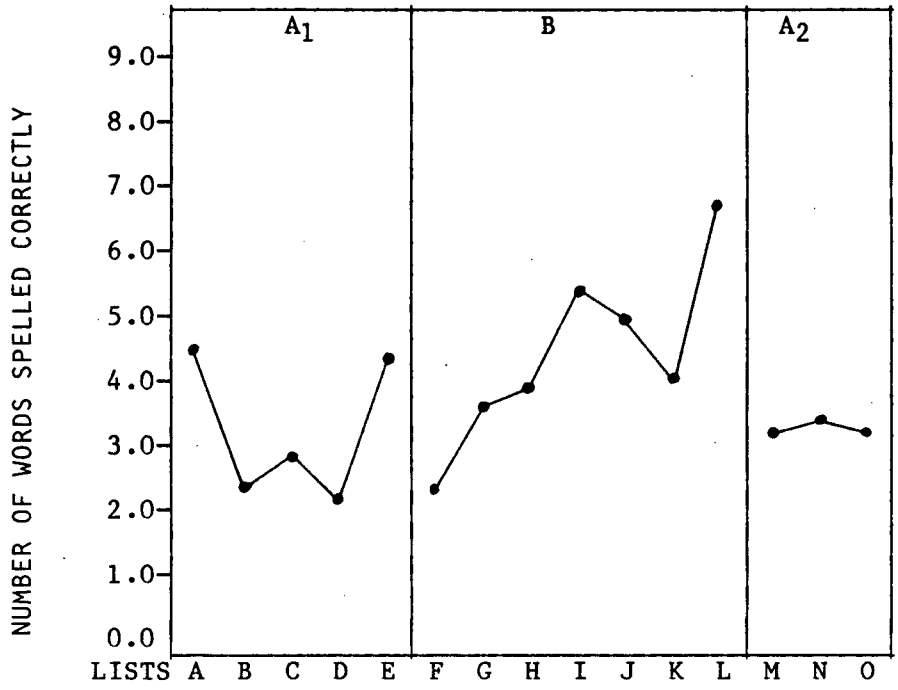

Figure 15 Number of words spelled correctly by pupil 09 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 09 was a female regular class student. The mean achieved for baseline (A_1) was 3.30, for intervention phase, 4.47, and for baseline (A_2), 3.36.

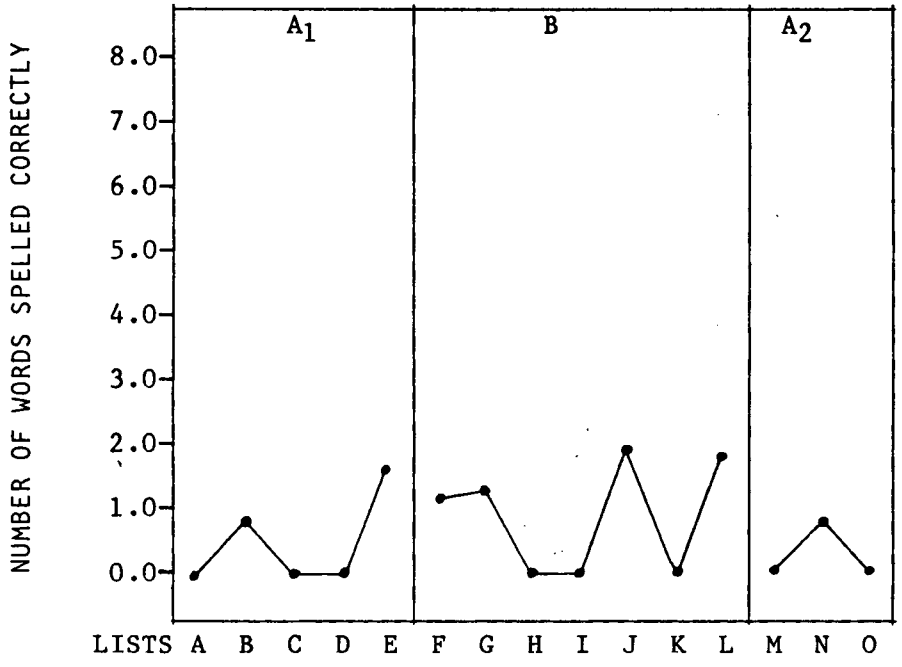

Figure 16 Number of words spelled correctly by pupil 10 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 10 was a male special class student. The mean achieved for baseline (A_1) was 0.50, for intervention phase, 0.92, and for baseline (A_2), 0.26.

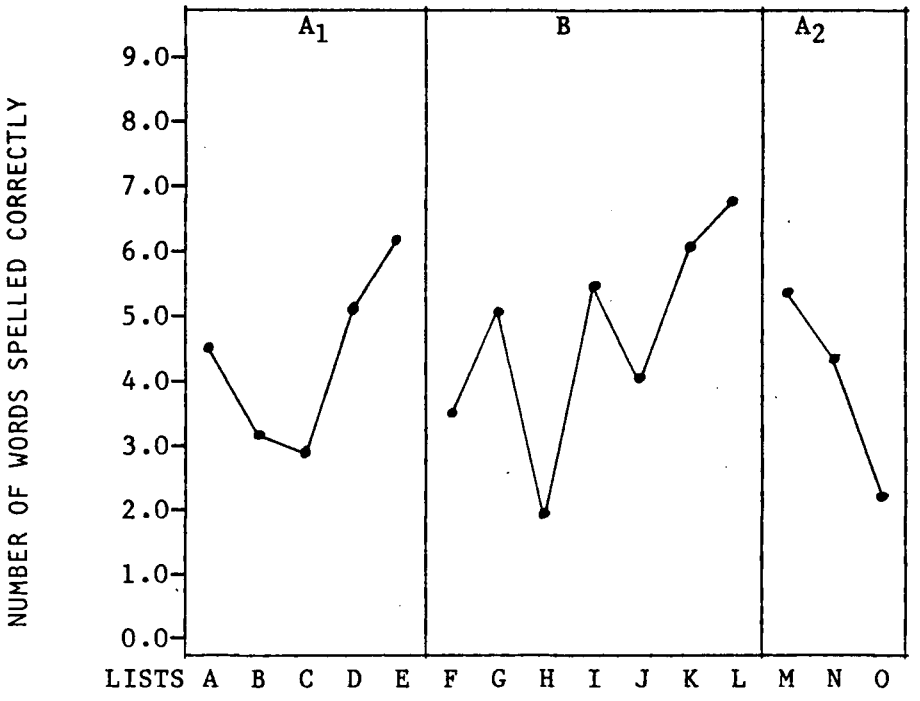

Figure 17 Number of words spelled correctly by pupil 11 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 11 was a male regular class student. The mean achieved for baseline (A_1) was 4.42, for intervention phase, 4.70, and for baseline (A_2), 4.03.

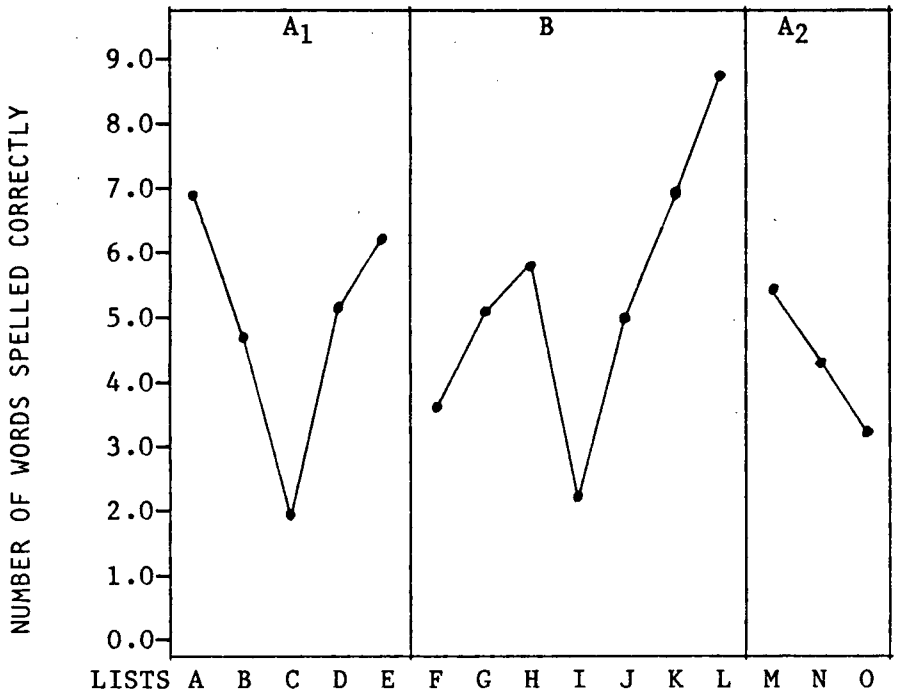

Figure 18 Number of words spelled correctly by pupil 12 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 12 was a female regular class student. The mean achieved for baseline (A_1) was 5.00, for intervention phase, 5.34, and for baseline (A_2), 4.40.

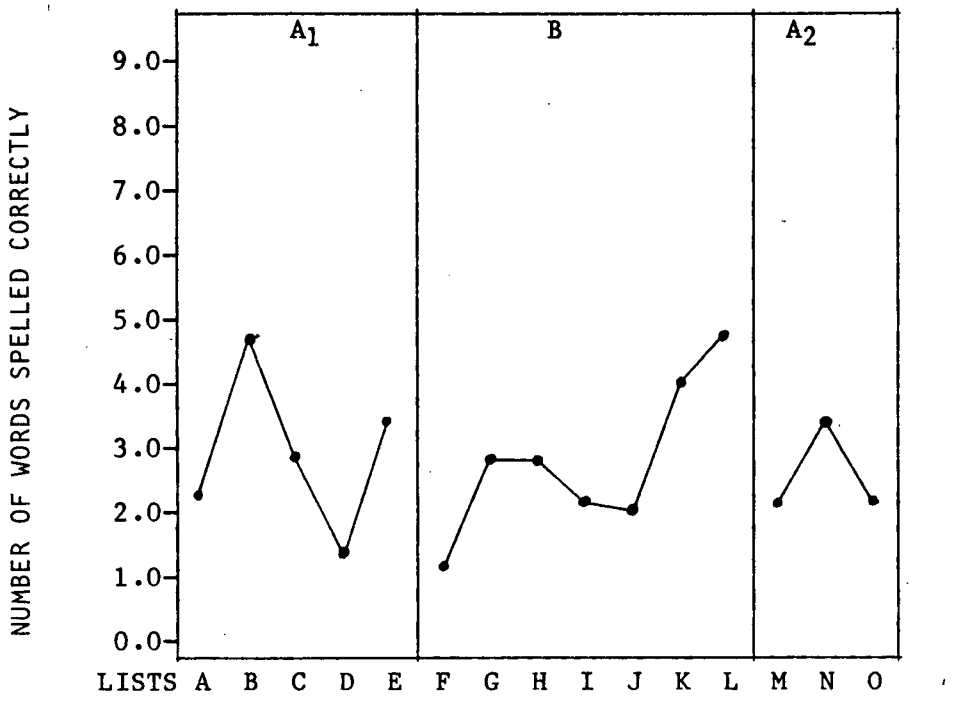

Figure 19 Number of words spelled correctly by pupil 13 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 13 was a male special class student. The mean achieved for baseline (A_1) was 2.98, for intervention phase, 2.85, and for baseline (A_2), 2.63.

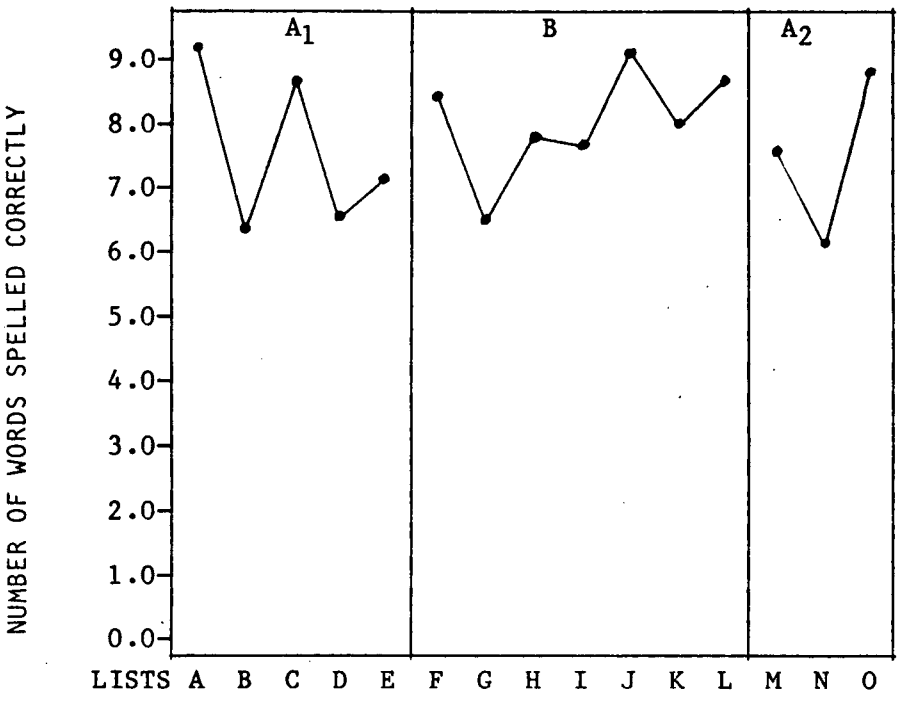

Figure 20 Number of words spelled correctly by pupil 14 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 14 was a female regular class student. The mean achieved for baseline (A_1) was 7.60, for intervention phase, 8.05, and for baseline (A_2), 7.56.

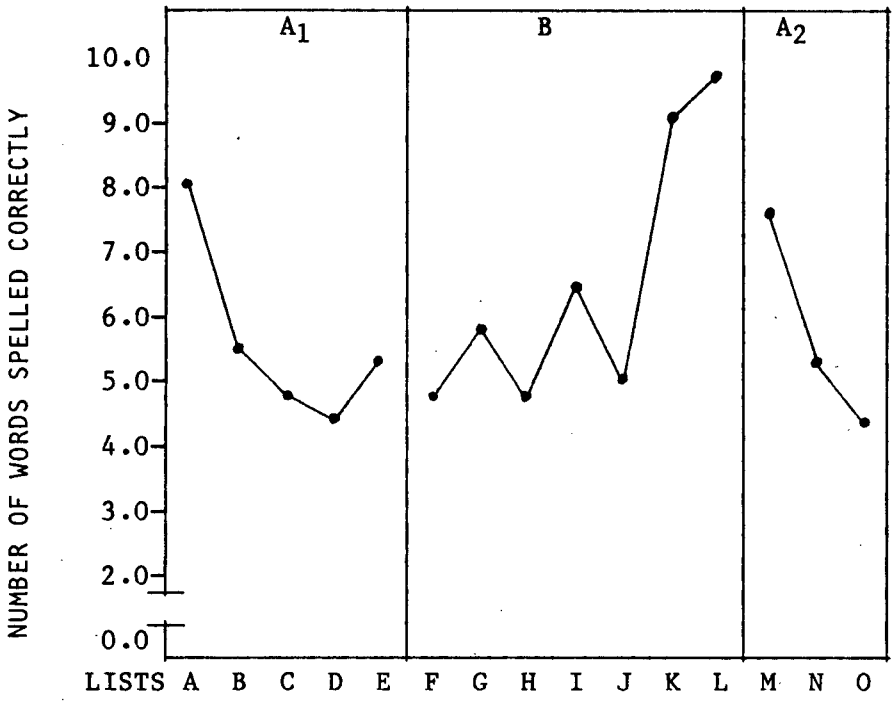

Figure 21 Number of words spelled correctly by pupil 15 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 15 was a female regular class student. The mean achieved for baseline (A_1) was 5.64, for intervention phase, 6.55, and for baseline (A_2), 5.80

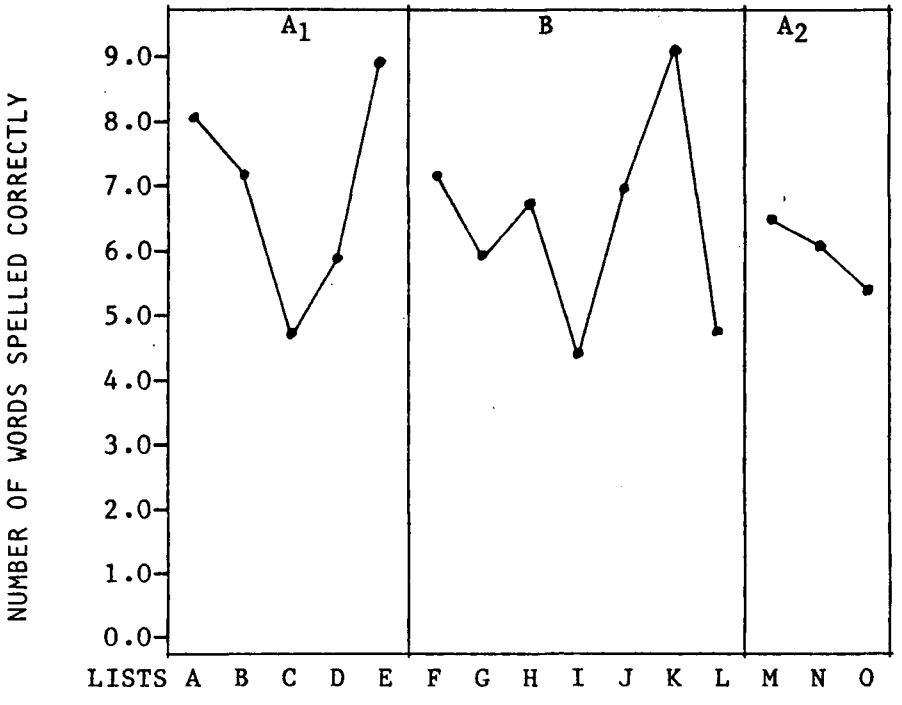

Figure 22 Number of words spelled correctly by pupil 16 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 16 was a male regular class student. The mean achieved for baseline (A_1) was 6.98, for intervention phase, 6.45, and for baseline (A_2), 6.10.

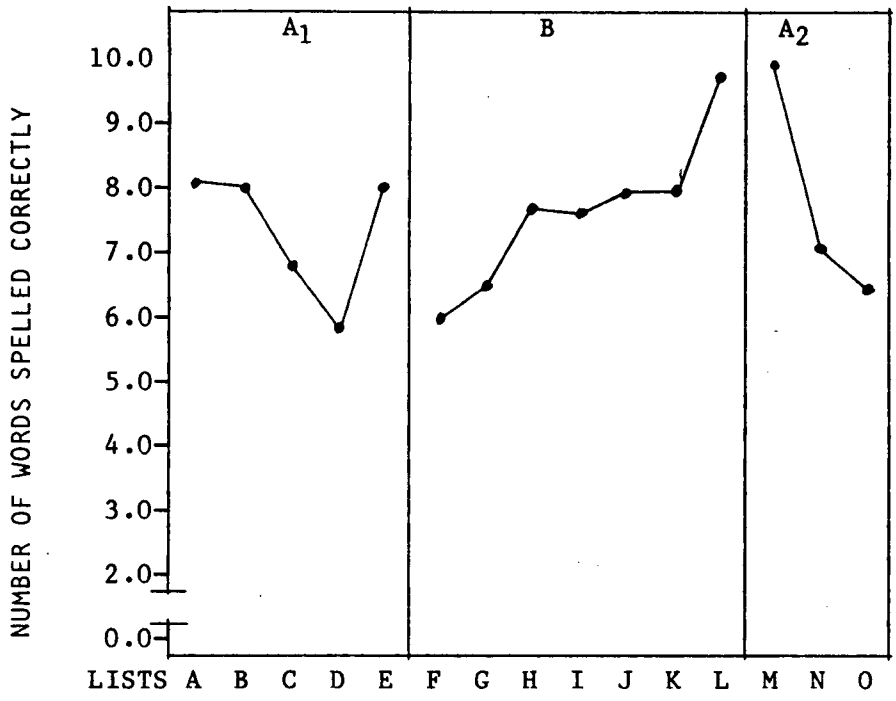

Figure 23 Number of words spelled correctly by pupil 17 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 17 was a male regular class student. The mean achieved for baseline (A_1) was 7.36, for intervention phase, 7.68, and for baseline (A_2), 7.86

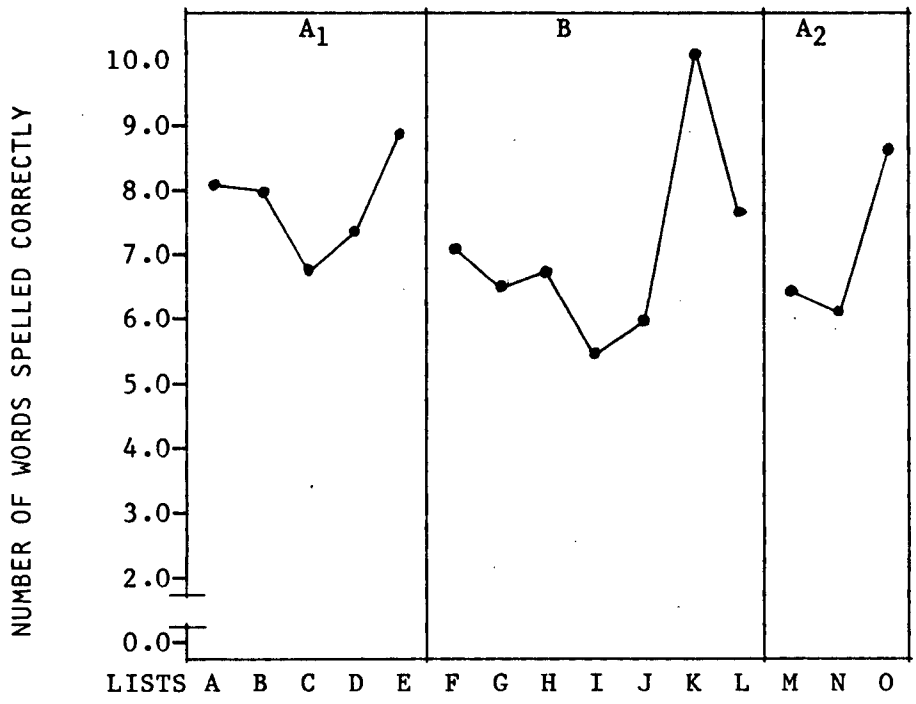

Figure 24 Number of words spelled correctly by pupil 18 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 18 was a female regular class student. The mean achieved for baseline (A_1) was 7.84, for intervention phase, 7.14, and for baseline (A_2), 7.20

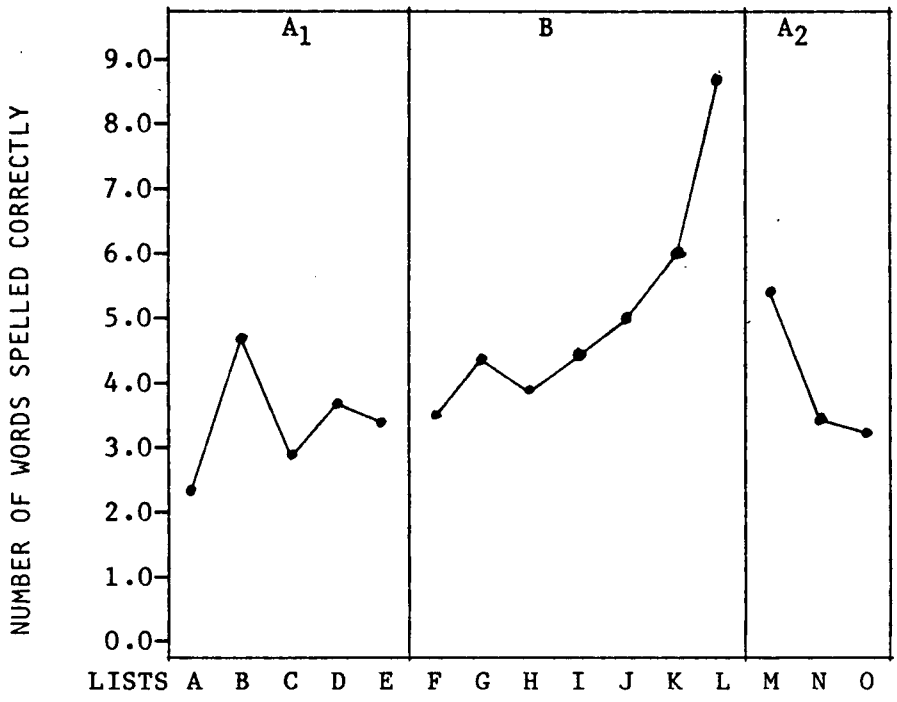

Figure 25 Number of words spelled correctly by pupil 19 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 19 was a female regular class student. The mean achieved for baseline (A_1) was 3.44, for intervention phase, 5.14, and for baseline (A_2), 4.10.

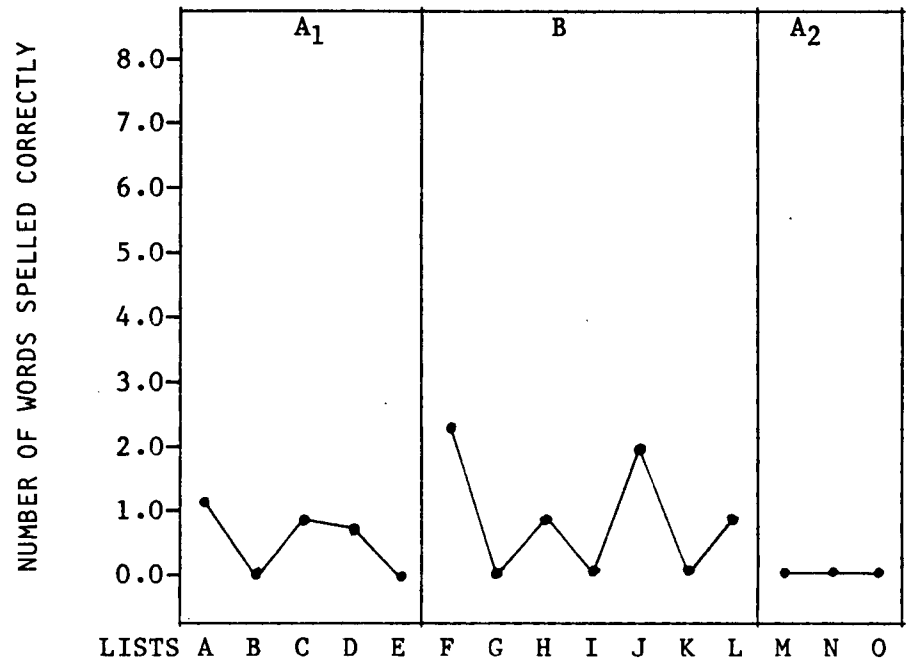

Figure 26 Number of words spelled correctly by pupil 20 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 20 was a male special class student. The mean achieved for baseline (A_1) was 0.56, for intervention phase, 0.88, and for baseline (A_2), 0.00.

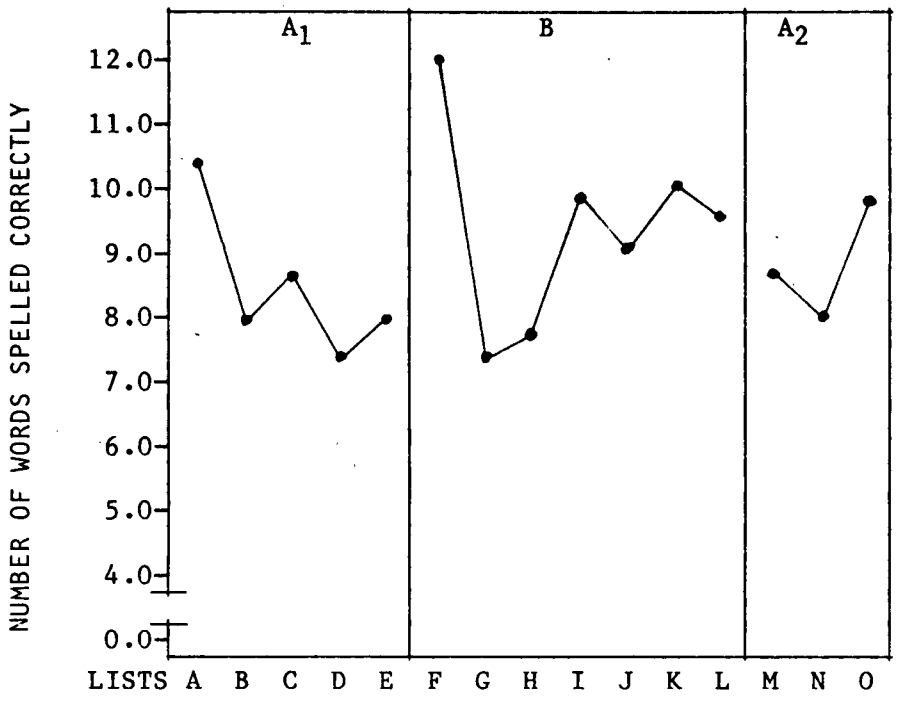

Figure 27 Number of words spelled correctly by pupil 21 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 21 was a male regular class student. The mean achieved for baseline (A_1) was 8.50, for intervention phase, 9.42, and for baseline (A_2), 8.90.

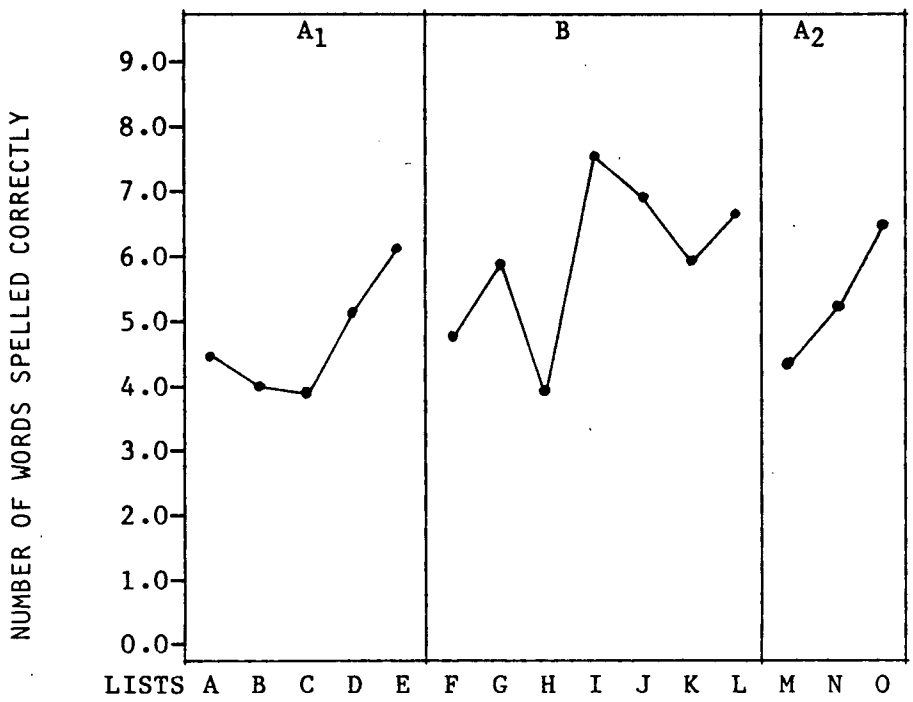

Figure 28 Number of words spelled correctly by pupil 22 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 22 was a male regular class student. The mean achieved for baseline (A_1) was 4.78, for intervention phase, 6.01, and for baseline (A_2), 5.43.

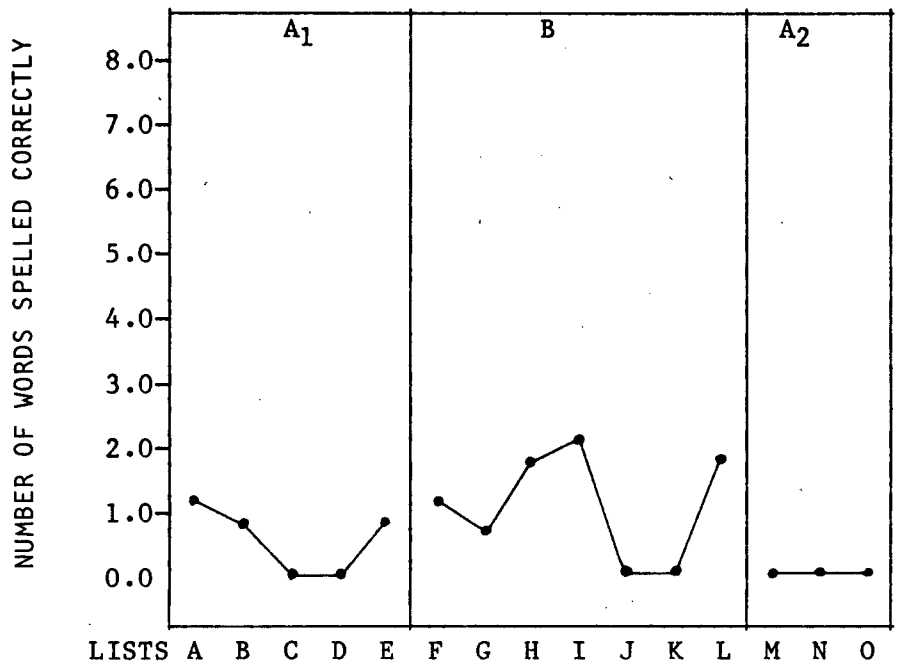

Figure 29 Number of words spelled correctly by pupil 23 during baseline (A_1) intervention and baseline (A_2) phases.

Pupil 23 was a male special class student. The mean achieved for baseline (A_1) was 0.56, for intervention phase, 1.12, and for baseline (A_2), 0.00.

Table 3

Individual Student Means for Each Phase

Student	Average Adjusted Score for A_1	Average Adjusted Score for B	Average Adjusted Score for A_2
01	3.70	3.37	3.66
02	6.72	6.45	5.80
03	8.24	9.08	5.20
04	5.08	5.48	4.83
05	6.86	8.20	6.90
06	2.38	4.07	3.66
07	0.56	1.74	0.26
08	6.12	7.32	5.50
09	3.30	4.47	3.36
10	0.50	0.92	0.26
11	4.42	4.70	4.03
12	5.00	5.34	4.40
13	2.98	2.85	2.63
14	7.60	8.05	7.56
15	5.64	6.55	5.80
16	6.98	6.45	6.10
17	7.36	7.68	7.86
18	7.84	7.14	7.20
19	3.44	5.14	4.10
20	0.56	0.88	0.00
21	8.50	9.42	8.90
22	4.78	6.01	5.43
23	0.56	1.12	0.00

CHAPTER V

Interpretation of Results, Summary and Conclusion

The first question raised in this study was whether it was possible to increase the number of new words spelled correctly by exposing the students to those words embedded subliminally in music. The results indicate that the number of words spelled correctly was increased.

Similarly, the results showed there was a statistically significant difference in the average number of words spelled correctly by students in the regular class when compared with students in the special class. The increase in the number of words spelled correctly during baseline (A_1) and intervention (B) for the class was statistically significant, ($t = 3.9323$, $p > .01$); but for students in the special class, the comparison did not show statistically significant results, ($t = 1.5417$, $p < .1$). When comparing the number of words spelled correctly during intervention (B) and second baseline (A_2), both groups showed statistically significant decreases, (regular students, $t = 3.5048$, $p > .01$, and special class students, $t = 2.6099$, $p > .05$). Thus it would appear that the greatest gains in learning new words to spell by subliminal means are made by students of the regular class.

Comparison of scores between the boys and girls of the regular class showed no statistically significant differences. When comparing boys' with girls' baselines (A_1) ($t = .4058$, $p < .1$), comparing intervention (B), ($t = .6083$, $p < .1$), and comparing baselines (A_2), ($t = .3564$, $p < .1$). Obviously subliminal stimulation as used in this investigation equally affects both sexes.

Since the first test in the intervention phase to show a statistically significant increase in the number of words correctly spelled was List J, one may assume that the subliminal stimulation had a statistically significant effect after the students had been exposed to 82 subliminal stimulations. The project was modelled on Key's (1980) suggestion that the subliminal stimuli were effective in reducing shoplifting when recorded 30 to 40 decibels below the level of recorded music. Because the recording level of the music varies, one cannot be certain that the intensity of the music may not have obliterated some of the subliminal stimuli.

Perhaps only a certain percentage of the subliminal stimuli were effective. It is not possible to provide a definitive answer using the results obtained in this experiment. All that can be stated is that the first significant effect in the intervention phase took place after the students were exposed to 82 subliminal stimulations.

Summary and Conclusion

During the baseline, a class of twenty-three grade five students, including six special class students were given lists of words to spell. During intervention, following auditory subliminal exposure to word lists equalized in difficulty, they were tested. There was a progressive increase in the number of words spelled correctly. Following the intervention phase, during a second baseline phase, the number of words spelled correctly fell to within the range covered by the first baseline.

The results showed that auditory subliminal stimulation can be used to increase the number of words spelled correctly. This method was found to be more effective with students in regular class than with students in special class, and equally effective with boys and girls. Finally, a minimum of 82 subliminal stimulations appear to be necessary to produce the first significant increase.

Implications for Further Investigation - Limitations of the Study

No attempt was made to determine the reasons why subliminal stimulation was more effective with some students than with others. Since the stimulation was auditory, it seems reasonable to conjecture that those students who are stronger auditory learners may benefit most from the auditory subliminal stimulation. Also, since the stimulation ceased after 196 exposures, a further area of investigation should concern an increase in the number of exposures to stimuli to see if a maximum or ceiling effect occurs.

Instead of using music to mask the subliminal words, perhaps a better method would have been to use white noise, thus possibly ensuring a more stable presentation of words. Another aspect not covered in this investigation was the effect of delay in testing words which had already been exposed many times several days previously. Would the results have been different if all the exposures had taken place immediately preceeding the test?

While it is extremely difficult to construct word lists with equivalent spelling difficulty due to the many variables within each child's ability, it may have been more appropriate to have taken words

from the same frequency level and matched them for the number of syllables, diphthongs, digraphs, double letters, silent letters, and irregular phonemes rather than using the difficulty factor method used in this research.

Perhaps completely irrelevant trivia should be embedded as subliminal implants and exposed several hundred times to the students to see if any new learning had taken place, as this would effectively limit confounding the results with the students' prior knowledge. Similarly, another experimental design where the students were first pretested on the spelling words may have shown more clearly individual gains between regular and special class students, although any previous exposure to words included in the intervention phase would introduce a practice effect. A design involving a pretest would also have determined whether or not the students had previous knowledge of how to spell the words selected. In the design used in this study, conditions between A_1 and A_2 differed because music without subliminal stimulation was played to the class on the days that words were tested to establish the second baseline, (A_2), but this can be considered inconsequential. While the spelling words used were compiled over twenty years ago, Arvidson (1963) found that the original lists, which had been collected seventeen years before his research, "required very few changes...and indeed this was to be expected" (p. 8). Language changes are very gradual. Finally, the question can be raised whether the subliminal learning could be more effective if the student were to relax (Fiss, 1961) listening to music

through headsets rather than the generalized exposure of an open speaker unit in an active classroom. The areas of investigation suggested are numerous.

We need to know at what level below the level of recorded music subliminal implants remain effective. Does frequent exposure to subliminal messages make subsequent subliminal exposure more effective? Can subliminal stimuli be used to change aberrant behaviour? Could a new language be taught using subliminal stimuli only?

The questions seem limitless, but perhaps the most important is the one raised by Key (1973, 1976, 1980) when he asks if human behaviour is already being manipulated by the media using subliminal procedures to induce people to buy products which they may not want.

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