THE SHORT AND LONG TERM EFFECTS OF CONTINGENT AVERSIVE NOISE ON STUTTERING

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Modification of behaviour through aversive conditioning has had a history of a few decades. The early and also most frequent use of aversive conditioning has been in the problem areas of alcoholism and sexual disorders (Eysenck and Rachman, 1965). However, the application of aversive conditioning techniques to stuttering has been a recent affair, although the first published report appeared in 1937 (Van Riper, 1937).

There are several different stimuli that could be used in aversive conditioning like electric shock, chemical agents, noise, time out, traumatic respiratory paralysis, aversion relief, covert sensitization, and repugnance (Rachman and Teasdale, 1969). However, it is only recently that some systematic efforts have been made to evaluate the effective usefulness of at least a few of these stimuli under different conditions (Rachman and Teasdale, 1969; Rubin 1969). Chemical and electrical aversion techniques have been the most frequently used methods in modification of behaviour problems; chemical aversion, however, has largely been restricted to alcoholism. In the area of stuttering, the number of experimental studies on electrical aversion are relatively more than that employing other aversive stimuli. The results of these experimental efforts to modify stuttering with the help of electrical stimulus have not been unequivocal and they have been discussed elsewhere (Hegde, 1970).

Experimental studies on the effects of aversive noise on stuttering have been surprisingly few (Flanagan *et ah,* 1958; Goldiamond, 1962, 1964). Goldiamond in both of his studies used response-contingent delayed auditory feed back (DAF) and not just aversive noise; and hence it is difficult to interpret this data although the possibility of DAF being aversive cannot be ruled out. The Flanagan *et al.*, study, the first one to use a blast of 105 dB tone as an aversive stimulus reported a decrease in stuttering. Stuttering decreased in frequency when the blast of aversive noise was made contingent on each speech block; it increased during the extinction period when the noise was made contingent on each speech block; it increased during the extinction period when the noise was removed and stuttering also increased in the escape condition wherein termination of the continuous aversive noise was made contingent on stuttering.

Although studies on response contingent aversive noise have been few, the same is not true of studies on the effect of masking and DAF on stuttering. A

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number of studies have been reported on these two variables which have generally shown that stuttering decreases under these two conditions (Soderberg, 1969 for a review). A clearer interpretation of the favourable effects of masking, and DAF on stuttering is yet to be achieved and there certainly are important differences between DAF and masking on the one hand and response contingent aversive noise on the other. Nevertheless an examination of the possible relationship between aversive noise and those variables, especially masking, seems to be warranted in the light of the sutton and chase (1961) study that reported a decrease in stuttering when the white noise was fed to stutterers ears even during periods of silence. Although it is not a purpose of this paper to examine such a possible relationship, a brief mention will be made in the discussion.

In view of the relative paucity of studies on both the short and long term effects of aversive noise on stuttering, and the possibility that if proved useful, aversive noise would provide a relatively simpler method of modifying stuttering behaviour, the present study was undertaken. It was considered possible, in view of the psychophysiological adaptation to noise, that the short and long term effects of this stimulus may be different and that a mere demonstrating of reduction in stuttering during experimental sessions would be of limited therapeutic implications. Because of such a possibility, the present study also included an experimental therapy programme.

Problem

The problem of the present investigation was to evaluate the short and long term efforts of response contingent aversive noise on stuttering.

Method

Short term effects.

Subjects: Eight stutterers attending the All India Institute of Speech and Hearing were the subjects. The average age of the subjects was 19 years; the youngest in the group was 17 and the oldest, 25. Very precise age of onset was not clear in all the subjects. However, all of,them had started to stutter during their childhood days. Seven of them were college students and one subject was a small shop keeper. On an average of two sessions of 25 minutes each of continuous reading, the subjects stuttered on 190 words. One stutterer with minimum difficulty had 58 blocks, calculated for the same period. Another stutterer with maximum stuttering had 320 blocks.

Apparatus: An apparatus was devised, on an experimental basis, at the All India Institute of Speech and Hearing, to produce aversive noise. The unit consisted of a battery eliminator, a pair of headphones, a control switch and the necessary connections. The experimenter manipulated the control switch to deliver aversive noise and also noted down the number of blocks in all the conditions. Although the noise level could be varied, the range was limited owing to

technical difficulties. All subjects received an aversive stimulus of about 124 dB.

Procedure: All the subjects were seen individually in all the conditions of experiment. Each subject was studied in a preliminary session to get familiarised with his characteristic stuttering behaviour. During the experimental and control sessions the subject was seated across a table and was asked to read from a Kannada magazine. In every session, a different but comparable passage was read by all the subjects.

During the experimental session the subjects were made to wear the headphones connected to the apparatus and were asked to read the chosen passage. Whenever the subject stuttered, the experimenter pressed the control switch that resulted in a sharp click-like noise that was fed to the stutterer's ears. The resultant aversive noise was only in terms of a blast and was not a continuous stimulus. The aversive noise was not made contingent on any specific aspect of stuttering. All hesitations, repetitions, and prolongations with or without the secondary adjustive behaviours were defined broadly as stuttering and aversive noise was made contingent on it. During the control sessions the subjects read for 25 minutes without aversive noise.

The experiment was conducted in two days, with two sessions on each day. A 15 minutes rest pause was given in between the two sessions on both the days. All the subjects were made to participate in both the sequences of experimental-control and control experimental sessions. A subject that started with control reading and went over to aversive conditioning on the first day did the reverse on the second day, and so on.

Long term effects.

Subjects: Five stutterers, who were, in terms of age and duration of stuttering behaviour, comparable to those who served as subjects in the experiments on short term effects, were selected for an experimental therapy programme with aversive noise. All of them were college students. This group stuttered, on an average, on 200 words in continuous reading for 25 minutes; one of them, however, was a severe stutterer with 350 blocks.

Apparatus: The same apparatus, described above, was used during therapy sessions.

Procedure: All stutterers received therapy in individual sessions, each lasting 25 minutes. Therapy was given on a daily basis, excluding Sundays and other holidays. During the therapy sessions, stutterers read long Kannada passages continuously; every occasion of disfluency as described above, was punished with aversive noise; the number of blocks were counted by the therapist. Therapy was continued for a period of three months and a reassessment of stuttering was done at the end of this period. Two stutterers were not quite regular to therapy while the other three were. The not very regular stutterers had about 60 sessions of therapy and the regular ones had about 75 sessions.

. Results

Short term effects

The results of the experiment on short term effects are given in Table I. The number of stuttered words are the averages of two sessions in each condition-aversive noise and control.

TABLE I. Showing the number of stuttered words in the experimental and control conditions the obtained X^2 value and the level of significance.

Subjects	*Number of words stuttered*	
	Noise	***Control***
1.	224	**259**
2.	**273**	**395**
3.	226	**254**
4.	**45**	**58**
5.	221	**237**
6.	**60**	**78**
7.	**73**	**91**
8.	**136**	**152**
Total	**1258**	**1524**

$X^2=9.20$ (P = 0.01)

The results given in the Table make it clear that all the subjects stuttered less under the noise than under the control conditions. Relative severity of stuttering does not seem to have affected the outcome for whether a stutterer stuttered relatively less (58 blocks in 25 minutes reading) or more (320 blocks) did not result in an altered individual trend. The subjects as a group stuttered on 1358 words in the noise and 1524 words in the control sessions. This observed difference was evaluated with the chi-square test based on equal probability or null hypothesis (Garrett, 1961). The obtained chi-square value of 9.20 was found to be significant beyond the 0.01 per cent level. Thus stutterers stuttered significantly less under aversive noise condition.

Long term effects

Assessment after three months therapy showed that stuttering had remained practically the same. The subjects as a group stuttered on 196 words on an average of two sessions of normal reading for 25 minutes as against 200 words for the same period before therapy. Also, the subjects did not report any change in their stuttering. The results are given in Table II.

TABLE II

Subjects	No. of words stuttered	
	Before Therapy	*After Therapy*
1.	175	168
2.	190	192
3.	75	76
4.	210	202
5.	350	344
Total	1000	982

X^3= .38 (Not significant)

The obtained chi-square value was not significant, indicating that three months aversive noise therapy did not result in change in stuttering behaviour.

It may be said, in summarizing the results that the short term effect of noise on stuttering during the experimental conditions seems to be favourable but the long term effect, generally, is not.

Discussion

The differential effects of short and long term aversive noise stimuli, although the data on long term effect presented here are not very precise and are only suggestive, present a few problems for interpretation. For, investigations in this area have been few and there is a great need for more precise data. Aversive noise has been used very infrequently, in behaviour modification research and this is so because of a few inherent problems in the use of noise as an aversive stimulus. One of the two important factors that limit the effectiveness of aversive noise is the restricted range of effective variation. If aversive noise is of moderate intensity, response suppression may not occur, but there is little agreement as to what exactly is the effective level of noise that suppress the response in a reliable manner. Azrin (1958) concluded that aversive noise of less than 105 dB may not be effective. However, it has also been observed that even 135 dB aversive signal may not suppress the response (Rachman and Teasdale, 1969). Rachman and Teasdale have thought that as the upper limit of auditory stimulation is approached at 135 dB, it may not be very useful to pursue the use of aversive noise. Thus, the limited range of aversive auditory stimuli imposes severe restrictions on its use. The second important factor is one of adaptation (Rachman and Teasdale, 1969). Although adaptation is a factor in all kinds of stimulation, it seems to be a quicker and more effective process in auditory stimulation. A certain level of auditory stimulus that was aversive to begin with may cease to be so as the stimulation continues; and consequently, the effects observed in the initial stages turn out to be transitory. One possible way of preventing rapid adaptation is to have a wide range of very different stimuli that can be used on a

random basis; but this possibility cannot be realised because the range of effective variation in auditory stimulation is itself limited.

That within short-term experimental sessions aversive noise can reduce stuttering to a significant extent is supported by the results of the present investigation. Some of the earlier studies have also shown a similar effect (Flanagan *et al*, 19S8; Biggs and Sheehan, 1968). However, the explanations of such a reduction have not been uniform. It has generally been considered within an operant model, that is, aversive noise is a punishing stimulus that results in a decrease in stuttering. A view point opposed to this has also been suggested, which considers reduction mainly in terms of distraction. For example Biggs and Sheehan (1968) have emphasized the importance of distraction whenever an aversive stimulus is used. However, the concept of distraction is not related to other experimental variables. Consequently, it is of very little value. Because of such a limitation distraction seems hardly to explain anything at all.

Explanation of the short term effects of aversive noise within an aversive-punishment model is also not completely satisfactory. For one thing, the very nature of aversive conditioning has been complex and full of theoretical difficulties. Aversion conditioning, in general, has been considered within three related but different paradigms: punishment, avoidance conditioning and classical conditioning. In their comprehensive review of these paradigms Rachman and Teasdale (1969) have pointed out some of the advantages of classical conditioning paradigms over those of others. Should the classical conditioning model be more appropriate to aversion therapy, it would then be difficult to assert, mainly on the basis of the short term effects of aversive noise, that stuttering is basically an operant response. And Secondly, the fading away of the aversive effects of noise in long-term application also indicates that probably stuttering is not behaving like an operant response under punishment. Further more, the effects of electric shock on stuttering results in an increase in stuttering behaviour (Hegde, 1970). Apart from the above mentioned difficulties with a strictly operant model as applied to aversive conditioning of stuttering, there still is a certain methodological problem in the applcation of response-contingent aversive stimulus. A strict operant model would demand that the aversive stimulus be a *consequence* of stuttering, that is, each block, should, so to speak, result in a punishment. However, a closer examination of the process of manipulation at least in the present study, reveals that this is not easily achieved in stuttering where excepting a few unusually severe cases, stuttering and fluency run in such a sequence that it is not always possible to arrange for a 'consequence' of a particular block. And hence in a manually operated equipment, the experimenter finds himself pressing the control switch of the *earliest* sign of a block, in order to avoid punishing the next word which may be a fluent utterance. As a consequence, the aversive stimulus is actually *paired* with the maladaptive response and does not come as a *consequence* of it, although it is still true that stuttering response proceeded the aversive stimuli. In view of these various difficulties, an effort is made below to explain tentatively significant effect

of noise under short-term experimental sessions and its ineffectiveness over long-term application within the classical conditioning paradigm.

That the frequency of stuttering response gets reduced when under brief experimental sessions aversive noise is applied may be due to what Pavlov called external inhibition. A conditioned response may get disturbed or weakened when an unusual stimulus strikes the organism at a time when the CR is being activated. Basically external inhibition is produced by any unfamiliar and distructing stimulus which can attract the subject's attention, and for this reason it can also be considered a kind of interference (Woodworth and Schlosberg, 1954). Since the external inhibition can also disinhibit the inhibitory process, parlor interpreted it to be a process that worked against any dominant process in the brain at the time. It has also been noted further that as the organism gets 'adapted' to the unfamiliar, disturbing, stimulus, the inhibitory effect of such a stimulus would diminish and hence at least the one kind of external inhibition has only a temporary effect. It is suggested that the initial and temporary effect of aversive noise on stuttering is a function of external inhibition. If then goes without saying that if the application of aversive noise is continued, the subjects get adapted to the stimulus and the initial effect is lost. Possibly, this is what happened with the five stutterers who received aversive noise therapy over a period of three months and who did not show significant change in their stuttering behaviour. This certainly, is a highly tentative suggestion which needs to be confirmed by further research.

It should be mentioned, however, that at least one stutterer, at a later time, did react favourably to aversive noise therapy. A report on this case has already appeared (Mahananda, 1970). This case was a milder stutterer whose difficulty was reduced to a significant extent in 60 sessions. Follow-up studies have also revealed that he has not only been able to hold on to the improvement he had shown but also has experienced further generalization subsequent to his discharge from the clinic. It is this outcome that imposes a certain limitation on the explanation suggested above. It is however, difficult to make statements on the basis of this one stutterer while the general outcome of aversive noise therapy has been disappointing.

Apart from the stuttering contingent aversive noise, masking with white noise has been another possibly related area of investigation. The results of making noise experiments have been relatively more uniform in showing significant decrease in stuttering under such conditions. It has generally been presumed that stutterers stutter less with making noise because the noise makes it difficult for the subjects to hear their own voice resulting in an interference in the feedback process, (Sutton and Chase, 1961). However, the finding that stutterers stutter less even when the white noise is fed to their ears during the silent periods in reading (Sutton and Chase; 1961; Webster and Dorman, 1970) contradicts the feed-back interference hypothesis. What seems to be an important in these experimental conditions is the fact that the occurrence noise would phonation and

thus would change the usual stimulus response conditions. It is reading or speaking under novel stimulus situations and this might alter the conditioned response—stuttering. This is just to suggest that response—contingent aversive noise and making may share a common characteristic and investigation on this possibility may prove interesting.

Summary

The effect of short and long term effects of response contingent aversive noise on stuttering was studied. Eight stutterers participated in two experimental and two control sessions, each session lasting 25 minutes. Stutterers read continuous passage and received response contingent aversive noise of about 124 dB during the experimental sessions. Five stutterers participated in an experimental aversive noise therapy programme. All the eight stutterers who participated in the experiments on short-term effects stuttered significantly less under experimental conditions. However, five stutterers who received three months' aversive noise therapy did not show any significant change in their stuttering behaviour. The short term temporary effects of aversive noise was interpreted in terms of external inhibition.