A study of the Effect of Palatal and Labial Anesthesia on Stuttering

DEVARAJ.N

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"I don't want to see any stutterer in thiS world. I am ready to undergo any experimentation leading towards understanding of the problem of stuttering"

- A stutterer who was a subject of this study.

TO MY SUBJECTS

CERTIFICATE

This iS to certify that the dissertation entitled "A STUDY OF THE EFFECT OF PALATAL AND LABIAL ANESTHESIA ON STUTTERING" is the bonafide work, in part fulfilment for MSc., Speech and Hearing, of the student with Registration No. 2.

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CERTIFICATE

This is to certify that thiS Dissertation has been prepared under my supervision and guidance

Guide 25/9/78

DECLARATION

This dissertation is the result of my own study undertaken under the guidance of Mr. N.P. Nataraja, Lecturer in Speech Pathology All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier at any University for any other diploma or degree.

Mysore
Date: 1978 Reg.No.

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CHAPTER I

INTRODUCTION

"Error-free speech content and error-free speech output indicates total positive feedback"

- Mysak (1966).

The feedback systems are important for automaticity of speech. Information about the speech output is fed back to the central integrating mechanism through auditory, tactile and kineathetic sensory channels.

Attempts have been made to explain speech disorders using feedback theories, including stuttering i.e., explanations for stuttering behavior have been offered on the basis of feedback theories. One such explanation is "........... stutterers possess a defective monitoring systems for producing sequential speech" (Van Riper, 1971).

Many studies have explored the roles of different feedback systems in stuttering.

Lee (1951) has found that introduction of delayed auditory feedback in normals disturbs normal flow of speech. Cherry and Sayers (1956) have reported improvement in fluency among stutterers when auditory feedback was experimentally eliminated using masking. While considering the role of auditory feedback in stuttering, Van Riper (1973) has stated that ". . . . .essentially, the position is that stutterers possess a defective monitoring system for producing sequential speech and the trouble seems to be due to distorted auditory feedback".

Several other investigations have been done to study the importance of auditory feedback in stuttering (Maraist, 1957; McCrosky, 1958; Wolf and Wolf, 1959; Stromsta, 1962; Butler, and Stanley, 1966; Webster and Lubker, 1968; Sklar, 1969).

On the other hand, there are studies investigating role of feedbacks other than auditory systems in stuttering. Backus (1938) has reported comparatively less number of stutterers among severely hard of hearing where stuttering is expected more in the group of severely hard of hearing because of loss of auditory feedback. Sutton and Chase (1961) have found that stutterers stutter less even when the white noise is fed to their ears during the silent periods, where auditory system does not take part.

Van Riper (1971) has stated that stutterers have no stuttering when giving commands by pantomime to skilled lip readers, because by concentrating their attention on the feel of their musculatures, the stutterers would be forced to do what all normal speakers probably do - controlling speech primarily by proprioceptive - tactile feedback.

Rathna and Nataraja(1972) have reported that a stutterer, under study, stuttered even during whispering and silent reading. This suggests that the other feedback systems, tactile and kinesthetic may be playing a role in stuttering other than auditory feedback as silent reading does not involve auditory feedback.

Bloodstein and Brutten (1966) have quoted Gregory (1960) that he has found no evidence of any impairment in the stutterers' neural auditory system for monitoring his speech output. Class (1956) and Moser (1967) have found poor performance in lingual form perception among stutterers when compared to normals.

Using bio-feedback technique for management of stuttering, Hanna et al (1975) have found improvement in fluency. They have stated that "..........he had indeed acquired an awareness of his laryngeal muscle activity". They have attributed the improvement to the awareness of laryngeal musculature activity. This goes in accordance with Van Riper's (1971) statement that attention on the feel of his speech musculature will help to control his speech primarily by tactile and proprioceptive feedback.

Studies which have used anesthetization to cut down the tactile and kinesthetic feedback also showed change in stuttering. Hutchinson and Ringel (1975) have found increase in stuttering in their subjects under oral sensory deprivation. But on the other hand, Manohar et al (1975) anesthetized tongue and reported improved fluency in their case.

Attempts have been made to reduce stuttering using prosthesis and oral appliances and they have reported improvement (Idehara, 1937; Sato, 1959; Robinson, 1964; and Schilling,1965). They have tried to explain improvement on the basis that prosthesis and oral appliances act as distractora. However, it may be noted that these prosthesis and oral appliances also disturb tactile and kinesthetic feedbacks in stutterers, when they are used. This might have brought the improvement in fluency.

Thus the present literature shows that the tactile and kinesthetic feedbacks seem to play a role in stuttering.

Feedback effect also seems to vary with respect to different parts from which the signal is feedback to central integrating mechanism for control of speech. Guitar (1975) has tested the effect of feedback from different parts of speech mechanism uaing bio-feedback technique. One of his subjects has shown more reduction in stuttering when lip site has been choosen to give feedback. Laryngeal site haa been moat effective in another. Laryngeal site and lip sites were most effective in the third subject.

So it was intended to study the effect of tactile and kinesthetic feedback from different parts of oral cavity viz., palate and lips.

Statement of the problem.

Problem is to study the role of tactile and kinesthetic feedback from palate and lips in stuttering. One way of studying this is by disturbing the feedbacks. This was done by anesthetization of palate and lips separately.

Purpose of the study.

Purpose of the study is to test the following hypotheses:

(i) No change in stuttering will be observed whan anesthesia is administered only to palate in stutterer.

(ii) No change in stuttering will be observed when anesthesia is administered only to lips in stutterer.

(iii) No stuttering like behavior will be observed when anesthesia is administered only to palate in normals.

(iv) No stuttering like behavior will be observed when anesthesia is administered only to lips in normals.

To test the hypotheses one stutterer and one normal were taken. Subjects were studied under following conditions :

(i) Reading and spontaneous speech before anesthetization.

(ii) Reading and spontaneous speech immediately after anesthetization.

(iii) Reading and spontaneous speech after one hour of anesthetization.

(iv) Reading and spontaneous speech after complete recovery from anesthetic effect.

These conditions were same for both palatal and labial anesthesia. Three judges analyzed stuttering behavior under these conditions.

Limitations of the study.

(i) Only limited subjects were taken.

(ii) Differentiation between tactile and kinesthetic feedbacks was not done.

(iii) Subjects reports were used to note the anesthetic effect.

Implications of the study.

(i) This study is expected to give an idea of role of tactile and kineathetic feedback in stuttering.

(ii) The results of the study may help to develop therapy techniques.

Definitions of some of the key words used in this study:

Stuttering.

There is no acceptable definitions of stuttering. For the present purpose, definition emphasizing observable behavioral features is stressed. It can be defined as repetition and/or prolongation of sounds and syllables which may be accomplished by silent pauses, repetition of part word or complete word. Emphasis on repetition and/or prolongations of sounds and syllables as the primary characteristics of stuttering is in accordance with standard definitions of stuttering by Wingate (1964).

Tactile sense.

Relating to touch or to the sense of touch.

Kinesthetic sense.

Pertaining to the sense by which muscular motion, position or weight are perceived.

Feedback.

Back flow of information is known as feedback (Van Riper, and Irwin, 1958.)

CHAPTER II

REVIEW OF LITERATURE

Cybernetics, the principles of automatic control, has been extended to biological systems by Wiener (1948). The system of cybernetics is also called 'servosystem'. Production of speech has also been explained on these lines.

Perkins (1977) has stated that the speaking process functions as a servosystem. In this, output is compared with input to check whether the intended output is achieved and to make corrections if necessary to achieve the desired output.

The influence of the Winner's (1948) Cybernetics theory has led to a number of hypothetical models, which consider closed feedback loops as the essential monitoring system for speech production (Fairbanks, 1954; Mysak 1966; Netsell, 1973; Hollien,1975)

Fairbanks (1954) in his model of speech production has included an effector unit, a sensor unit, a storage unit, a mixer and a comparator unit. According to this model, the output information that is feedback is matched against the patterns in the storage component which act as input. The mixer or controller regulating mechanism changes the instructions to effector system thus altering the output to reduce the future errors. He views speech as an example of automatic control. The acoustical output and the somesthetic feel of speech are fedback through various feedback systems. The fedback informations are used for comparison with the intended output.

Feedback refers to the process by which the output signals are fedback to the 'central system'. Without feedback, no automatic control is possible.

According to Van Riper (1971), information about the speech output is returned to the central integrating mechanism through tactile, kinesthetic and auditory sensors.

Role of these sensory feedback channels in monitoring different aspects of speech has been explored.

Liberman (1957) has presented a model of phonological perception in which speech production and perception are considered as two aspects of the same process. The motor theory, which is formed as a result of this model, maintains that the acoustic stimulus leads to a covert articulatory response and the proprioceptive feedback leads to discriminative event.

Henke (1967) has suggested that the timing or rate of articulatory activities is accomplished by proprioceptive feedback. As an example, Henke has described the production of a stop consonant in which ongoing activity waits until contact between articulators (closure) is attained. The awareness of this happening, presumably through proprioceptive feedback trigers further articulatory activity.

Ladefoged (1967) has hypothesized that the production of vowels depends more on auditory monitoring whereas the production of consonants depends more on oral sensory feedback.

Recording to Perkell (1969) vowels are produced through the action of slow extrinsic tongue muscle network under the primary influence of acoustic and myotatic feedback. Production of consonants is by combined function of the fast acting intrinsic as well as the slower extrinsic muscle system. This combined function is regulated by intra-oral air pressure and tactile feedback.

Ringel (1970) is of the opinion that the motor pattern are modified and restructured in accordance with information received from peripheral sensory resources.

Milisen (1966) discussing the development of articulation has stated that closed circuit feedback serves primarily as a monitor of self generated speech sounds.

Thus the review has shown that feedback systems are important in monitoring the speech output and different feedback systems control different aspects of speech. Van Riper (1971) has stated that it is notlceble from the nature of feedback systems that :

> "there are many possible sources of distortion in the feedback systems used to monitor speech. A synchrony of feedback signals that arrive in the right and left cortical hemispheres may be involved, differential delay in bone - tissue and air conduction of a person's voice"

might create the distortion in feedback resulting in distorted speech output. ".....to disrupt auditory, tactile or kinesthetic feedback would be to disrupt speech output" (Perkins, 1977).

Attempts have been made to study speech output under disturbed feedbacks.

As early as 1949, Hanley and Draegart have noted that when individuals speak in the presence of noise, loudness of voice is directly influenced by the intensity of the noise. This principle has been used in 'lambard test' in evaluation of functional hearing loss cases i.e., by giving masking noise to both ears and noting the changes in loudness of voice.

Fairbanks and Guttman (1958) have observed apeech under delayed auditory feedback and have found articulatory disturbances as primary effect and increase in vocal sound pressure level and fundamental frequency as indirect effects.

Peters (1954) has reported that speech rate increases when speaker's voice is accelerated and given back to his own ears through air conduction. Dolch (1954) also has reported that feedback acceleration in combination with the feedback being transmitted to the ears at 180 degrees out-of-phase to the signal emitted at the mouth encouraged harshness of voice, a slower rate, and increased intensity in the subjects vocal performance.

While these studies explain the role of auditory feedback system, in monitoring speech, other studies have been done to accentuate the role of tactile and kinesthetic feedback in monitoring speech production.

Ringel and Steer (1962) have studied the effects of tactile and auditory alterations on different aspects of speech output. Masking was used to disturb auditory feedback. Topical and block anesthesia were used to disturb tactile and kinesthetic feedbacks. They found that the simultaneous use of topical anesthesia and masking produced greater difference than that obtained for either condition of anesthesia or noise separately.

Masking noise produced significant change in the mean fundamental frequency. But anesthetic effect on oral region did not produce any change.

There was significant increase in phonation/time ratio in both masking and nerve block anesthesia conditions. Significant increase in mean syllable duration under masking noise was found. Statistically insignificant but relatively large difference in mean syllable duration was found under nerve block anesthetic condition than in other conditions.

No significant change in the overall word output per minute was reported in any of the experimental conditions.

Klein (1963) has studied speech by disturbing auditory. tactile feedbacks and both in combination. Topical anesthesia was used to disrupt the tactile feedback (without disturbing kinesthetic feedback). The findings reveal that disturbance of the tactile feedback alone caused articulatory changes and not others.

Mc Crosky (1958) has conducted two experiments which involved disturbing tactile, kinesthetic feedbacks during speech production. He has observed, by anesthetizing the articulators, that significant disturbance in articulation could be produced.

Ringel and Steer (1963) have investigated the effects of tactile alterations within oral cavity in isolation and in combination with auditory disturbances on speech performance.

The findings have shown that anesthetizing the articulators caused a greater degree of articulatory disturbance than did auditory masking.

As these studies suggest the different aspects of speech seem to be monitered by different feedback systems, the disordered speech has also been explain on the basis of different disordered feedback systems (Mysak, 1966). Stuttering, being a speech disorder, is also been explained on the same grounds.

According to Van Riper (1971) (the view on stuttering is that the) stutterers possess a defective monitoring system for sequential speech. Behaviors similar to stuttering can be produced in normal speakers by altering the auditory feedback of their speech output. Further, marked reduction in stuttering can often be achieved by altering auditory feedback in stutterers. From these findings, the possible existence of perceptual disability in stuttering, probably organic in nature has been infered (Van Riper, 1971).

Mysak (1960) has used servotheory to explain stuttering. He states that some anomaly of motor speech and related areas, represented as controller unit in his model, may give rise to uncontrolled release of electrical potentials and disturb governer and mixer units. Disturbing the comparator by an outside source results in hesitation, slowing, distortion, repetition of words, syllables - creation of fluency errors.

According to Van Riper (1973) 'the trouble seems to be' due to distorted auditory feedback. Motor speech is largely controlled automatically rather than voluntarily. Motor speech requires a reliable flow of information from the output, if it is to be integrated for the purpose of automatic control. This feedback is through multiple bilateral channels and is processed at many level in the central nervous system. Since speech demands an incredibly precise synchronization of simultaneous and auccesaive bilateral motor responses, distortion could produce asynchrony and lead to stuttering.

Cherry and Sayers (1956) have offered the assumption that ".......the production of speech involves a closed cycle feed-back action, by which means a speaker continually monitors and checks his own voice production" and that stuttering represents a type of relaxation osscilation caused by instability of the feedback loop.

Some investigators (Black, 1950; Lee, 1951; Atkinson, 1952; Tiffany and Hanley, 1952) have reported vocal changes such as increased intensity, slower rate and rhythm breaks similar to stuttering under conditions of delayed auditory feedback.

Wolf and Wolf (1959) have considered stuttering as a problem due to a 'closed-time lag' between auditory input and motor output.

Stromsta (1962) has hypothesized that arrival times of bone conducted and air conducted side tone may be different in stutterers than in normal speakers. Butler and Stanley (1966) have suggested that the locus of the malfunctioning may be in the middle ear and that this interrupts the automatic programming of the motor output.

Tomatis (1963) has attributed the disruption of the speech in stutterers to :

(i) delay created by the use of the nondominant ear for the self perception of speech, and

(ii) intracerebral delay interval which acts much in the same way as that involved in delayed auditory feedback.

According to Gruber (1965), too much information (overload) in the auditory feedback than in the factual and kinesthetic feedback circuits may produce fluency breaks.

Sklar (1969), an engineer, has suggested reducing auditory feedback as a therapeutic means. He believes that this helps in stabilizing oscillating servosystem.

Webster and Lubker (1968), have offered an auditory interference theory of stuttering. While accepting that this interference may be produced by various distortions in the feedbaok signals. For them, the nature of the interaction between air and bone conducted auditory feedbacks in the ear of the stutterer is important. If interaction between air and bone conducted feedback signals produces momentary phase or frequency distortion, it is possible that the resultant signal becomes a sufficient stimulus to produce interference.

According to Martin (1970) stutterers set too stringent a criterion and so incoming signals are misevaluated. He has stated that "in the case of a moment of stuttering, it is my hypothesis that the criterion becomes excessively conservative and decision time in the comparator is slightly delayed. In this way, speech becomes distorted in a manner similar to the distortion in the speech of normals under delayed auditory feedback".

Role of tactile and kinesthetic feedback in stuttering.

Thus the above studies have shown that fluency is facilitated under disturbed auditory feedback in stutterers. Some possible explanations have been offered to explain improved fluency under delayed auditory feedback in stutterers. Perkins (1977) has explained this improvement in fluency as being due to distraction or due to the improved function of the deficient auditory sensor for rhythm control. Mysak (1976) has offered another explanation that the improved fluency in stutterers under delayed auditory feedback may be due to forced transference of speech rhythm control to a more matured or less loaded tactile, kinesthetic sensor.

According to Mysak (1976) the disordered rate and rhythm symptoms may occur because of problems in the auditory sensor or in the tactile kinesthetic sensor. He, further has stated that,

> "hypersensitivity of the auditory sensor may be supported when increased disfluency is elicited in a client who is following verbal instructions by the clinician to the client to listen more carefully to his own speech in order to control disfluency. On the other hand, if, in children about 10 years old or older, instructions to them to pay more attention to the feel of the articulators during speech elicit greater fluency, then one may hypothesize that some delay in transference from auditory to tactile - kinesthetic sensor control of speech rhythm may be present".

Regarding the role of tactile and kinesthetic feedback in maintaining fluency, Van Riper (1971) has stated that if the disruption in timing which produces stuttering is due to distorted auditory feedback, it would follow that masking should reduce stuttering. "The need to disregard DAF signals (to beat the machine) would also stop the stutterer from continually listening to himself and thereby improve his fluency. He would be forced to do what all normal speakers probably do - control his speech primarily by proprioceptive - tactile feedback" i.e., by concentrating his attention on the feel of his speech musculatures, the stutterer can improve his fluency.

Van Riper (1971), while considering the development of stuttering, has pointed out that the child who develops stuttering fails to make an appropriate transfer in speech monitoring from the auditory channel to the proprioceptive channels.

Sheehan (1966) has hypothesized that speech is normally monitored by proprioceptive feedback and stutterer represses this proprioceptive feedback as he experiences stuttering as unpleasant and punishing.

Van Riper (1971) has reported that stutterers speak more fluently while whispering and completely fluent when pantomiming speech. Further he has stated that ". . . . .we found (in an unpublished study) that stutterers had no stuttering when giving commands by pantomime to skilled lip readers". Mackenzie (1955) has reported that the complete reduction of stuttering was produced by using an electrolarynx, a process which requires a high degree of conscious articulation in the pantomiming movements.

Several reports are also available (Oldrey, 1953; Irving and Webb, 1961) showing that laryngectomized stutterers who learn esophageal speech do not show any stuttering. This may probably due to very careful articulation to compensate possible loss in the acoustic features of esophageal speech (Van Riper, 1971).

Rathna and Nataraja (1972) have found that 6.6% of 707 stuttering cases had hearing loss. Though they have suggested possible relationship between hearing loss and stuttering, they have reported a case who stuttered even under whispering and silent reading.

Sutton and Chase (1961) and Webster and Dorman (1970) also have found that stutterers stutter less when white noise was presented even during the silent periods, where auditory system does not take part.

Thus the review indicates that the feedback systems other than auditory system, play a role in stuttering i.e., tactile and kinesthetic feedbacks also play a role in stuttering.

Cohen and Hanson (1975) have studied the abilities of stutterers in matching auditory-temporal (tapping) patterns with visual-spatial (dot) displays. They have concluded that stutterers possess some specific neurological dysfunction. This dysfunction interfers with their ability to perform efficiently in receptive functions such as inter-sensory integration as well as speech production.

Class (1956) has found that lingual form perception was poor in stutterers when compared with normals. Similar report has been made by Hoser (1967).

Van Riper (1973) has stated that the rarity of stuttering in congenitally deaf and absence of stuttering after laryngectomy emphasize someathesia in monitoring of ongoing speech. Further he has mentioned normal speakers can speak well in a noisy boiler factory. They have learned to control their speech by feel and not by sound. Even when they became deaf, they do not stutter. Van Riper (1973) with reference to therapy with stutterers states that "we want him to do what normal speakers do, monitor his speech by somesthetic cues primarily".

Van Riper continues to state that "we feel that most stutterers ignore, what their mouths are doing, perhaps because they do not learn to know. We feel that they need more information in their somesthetic feedback circuits".

These suggest that the tactile and kinesthetic (Somesthetic) feedbacks play a role in stuttering.

Hutchinson and Ringel (1975) have given three possible results under oral sensory deprivation among stutterers. They have given explanations also.

1. Reduction in stuttering : If reduction in stuttering occurs under oral sensory deprivation, it shows the inability of the stutterer to monitor the articulatory events of the block. So stuttering is within the peripheral frame work.

2. No marked change in stuttering : If no marked changes in stuttering occur under oral sensory deprivation, it means that oral sensory information plays no significant role in the control of stuttering.

3. Increase in stuttering : If increase in stuttering occurs under oral sensory deprivation, two explanations are possible :

(a) Stuttering increases as a result of organismic stress (Brutten and Shoemaker, 1967).

(b) Stutterer may learn to reduce the frequency and severity of stuttering and this refinement of the block would require peripheral feedback. Thus if the oral sensory information is lost, a more severe form of stuttering would result.

They have found increase in stuttering in terms of prolonged articulatory postures. ^

Manohar et al (1975) have studied a stutterer under cfour conditions viz., (1) base rate (2) 105 dB SPL masking noise, (3) lingual anesthesia and (4) masking noise and lingual anesthesia. All these conditions involved reading and spontaneous speech sessions. They have analysed repetition and eyeblink responses only.

Their analyses have shown maximum reduction in repetition under lingual anesthetization in reading condition. Eye blink responses showed maximum reduction under lingual anesthesia during spontaneous speech. They have concluded that each condition viz., masking, anesthetization and combination of both seem to decrease stuttering.

Guitar (1975) has tried to the relationship between decrease in stuttering frequency on initial phonemes and reduction of electrical activity at each muscle site of speech organs using analogue electromyographic feedback. He has choosen four areas to give feedback viz., laryngeal site, lip site, chin site and frontalis site (as a control). Subjects demonstrated different responses. One subject showed greater decrease in stuttering frequency when feedback was associated with lip site. Another subject showed greater reduction in stuttering when feedback was given from laryngeal site. Third subject showed greater reduction in both laryngeal and lip sites, when feedback was given.

This study suggests that stuttering may be due to distorted feedbacks in different parts concerned with speech production. In this view. Van Riper (1973) also has stated that there are stutterers whose stuttering appears to be focussed at the laryngeal area.

Thus the review of literature indicates that tactile and kinesthetic feedbacks from oral cavity play an important role in speech and disturbance of which would bring about disturbance in speech. Hence it is proposed to study the "effect of palatal and labial anesthetization on stuttering".

CHAPTER III

METHODOLOGY

The study involved three parts.

Part 1 - Preparation of materials and obtaining norms.

(a) Preparing reading materials and finding normal variation in reading rate.

(b) Finding variation in speech rate in normals.

Part 2 - Experiment .

(a) Experiment No. 1 - Reading and speaking under Anesthetization of palate only.

(b) Experiment No. 2 - Reading and speaking under Anesthetization of lips only.

Part 3 - Analysis.

Analysis of materials by judges to note the blocks in speech and reading sessions of the experiment part.

PART 1

The experimental procedure involved eight reading sessions for each subject. So eight different reading materials comparable to each other, were prepared using the following procedure. This was done to avoid any possible 'adaptation effect' (Van Riper, 1971).

Preparation of reading materials.

Reading materials in English collected from different magazines were given to five normal speakers. All five normal speakers choosen were knowing English. And none of them was a native speaker of English. All of them were undergraduates. Average age of these speakers was 19.2 years with a range of 19 to 20 years. They were not aware of the purpose of the experiment.

Instructions to the subjects.

'Now you have to read the printed material given to you for five minutes. Please try to read the way you read normally You have to read twelve printed materials. You can take next reading material when you feel comfortable".

Totally 12 reading materials were given to all five subjects. Subjects were asked to read each material for 5 minutes. Materials were not given at a stretch. They read the material whenever they felt free and comfortable

Number of syllables/minute read by each individual, for all reading materials was counted. Mean of syllables/minute for each reading material was calculated. Grand mean of syllables/minute was also calculated. This value gave rate of reading for normals. These values are given in table A.

For the purpose of choosing eight materials which had nearest mean value to the Grand Mean Value i.e., 232.99 syllablas/minute, difference in mean values from grand mean was calculated. This is also given in table A. Reading materials which had less mean value difference i.e., which had nearest mean value to the Grand mean value were considered as stable. Hence they were comparable reading materials in different experimental conditions. Thus, except reading materials 4, 6, 9 and 12 remaining were taken as reading materials for the study.

Average number of syllables/minute among selected stable reading materials ranged from 229.56 syllables/minute to 334.60 syllables/minute. One subject (subject No. 2) showed maximum variation in reading rate among the eight materials i.e., from 240 syllables/minute to 256 syllables/minute (16 syllables/minute)

No other subject had a variation of more than 16 syllables/ minute. Any change in rate of reading, under experimental conditions, within 16 syllables/minute will be treated as normal variation only.

Table A

Syllables/minute read by normal speakers for 12 reading materials

Subjects	1	2	3	4	5	6	7	8	9	10	11	
1	209.4	214.4	212.4	205.0	211.2	216.0	214.2	213.6	208.2	210.0	214.0	214
2	252.0	244.4	255.0	247.2	254.8	238.0	254.8	256.0	234.0	240.0	252.2	260
3	238.0	233.0	234.0	225.4	240.0	254.2	238.2	237.4	228.0	235.0	235.6	246
4	204.0	206.6	206.0	208.0	206.4	221.0	208.0	206.2	203.2	204.0	205.0	214
5	264.0	259.8	262.0	255.0	258.4	266.0	257.8	258.8	244.0	258.8	260.2	266
Mean	233.48	237.52	233.48	228.12	234.16	239.04	234.4	229.56	223.40	229.56	233.40	240
Difference from grand mean	0.49	1.47	0.89	4.87	1.17	6.05	1.61	1.41	9.51	3.43	0.41	7.

Grand mean - 232 .9

Preparation for/on spontaneous speech.

To find out normal variation in terms of syllables/minute in speech, following procedure was conducted :

The same five normal speakers were taken for the purpose. They were not aware of the purpose of the experiment. They were instructed as follows :

"Now you have to talk spontaneously in English on your past experience for five minutes. Please try to speak the way you normally speak. You have to speak four times with a gap of one hour in between sessions."

The five subjects were asked to speak spontaneously four times with an interval of one hour between each sessions. And they were recorded on Phillips Cassette Tape Recorder (type N2218). Recording was done in a silent room.

The recorded samples were transcribed by the experimenter and the number of syllables/minute was counted for each spontaneous speech session for all subjects. Table B shows the variation in number of syllables for each subject. Syllables were counted on 'Peak type'* method (Hocket, 1958).

Table B

Variation of number of syllables/minute for normal speakers

Subjects	Minimum number of syllables/ minute	Maximum number of syllables/ minute	Range
1	226.2	231.4	5.2
2	240.0	245.0	5.0
3	233.4	238.0	4.6
4	238.8	243.0	4.2
5	231.0	238.4	7.4

*'Peak Type : The syllables systems of English is of the 'Peak' type. Syllables in English are determined by the number of peaks - phonetically the most prominent element of syllables.

The syllables were counted to note the possible variation from sample to sample of spontaneous speech of the same subject and between subjects. Maximum variation of 7.40 syllables/ minute was shown by subject No. 5. Any change in the rate of speech, under experimental conditions, within 7.40 syllables/ minute will be treated as normal variation.

Thus the rate of speech and rate of reading in normals were obtained. This was done to make a comparison with the scores obtained by subjects under experimental conditions.

Both reading and spontaneous speech conditions were included in the study as reading and speaking conditions are the only two ways of checking speech output.

PART 2 : Experimental Procedure.

To study the stuttering behavior under palatal and labial anesthesia, two subjects were taken. Among them one was a stutterer (s) and another was a normal subject (N).

Description of subjects.

	Stutterer	Normal
Age	21 years	19 yeara
Sex	Male	Male
Education	Undergraduate Knowing English	Undergraduate Knowing English
Hearing	Normal	Normal
ENT	No abnormality	No abnormality
Speech	Stuttering	Normal

Description of stutterer's speech,

He had stuttering since childhood. His stuttering was characterized by repetitions, prolongations and pauses. No secondaries were observed. He had reported it to be consistant through out the period. He had reported that he had equal difficulty in reading and in spontaneous speech. No difficulty on specific sounds were reported.

Procedure.

First base rate of stuttering was noted by the experimenter ten days before experimentation. After ten days i.e., immediately before experimentation, base rate of stuttering was again noted by the experimenter. Previously the base rate was 56 blocks per five minutes for reading and 53 blocks per five minutes for spontaneous speech. Immediately before experiment it was found to be 57.2 blocks per five minutes for reading and 56 blocks per five minutes for spontaneous speech. This showed consistency in his stuttering.

Experimental procedure was divided into two parts viz., experiment number 1 and experiment number 2. Experiment number 1 consisted of anesthetization of palate only. Experiment number 2 consisted of anesthetization of lips only.

The experiment was conducted in a silent room. Subjects' prior consent was taken as experimental procedures involved injections to palate and lips. Subjects were informed of experimental procedures, but they were not aware of the purpose of the study.

Subjects were made to sit comfortably on a chair with satisfactory light. Tape Recorder was kept at a distance of approximately 2 feet from speaker's mouth. Subjects wwrw asked whether they need any more comforts regarding seats, light and ventilation and they were provided when asked for.

Both subject 'S' and subject 'N' underwent following experimental procedures.

Experiment No. 1. Anesthetization of palate only.

This experiment consisted of four sections. Each section had one reading session and one spontaneous speech session.

Section 1.

Condition before anesthetization i.e., control condition No, 1.

Procedure 1. (for reading session).

Instructions to the subjects.

"Please read this passage for five minutes. Please start only when I say 'start', Stop reading when I say 'stop' ".

Subjects read one reading material which was given in selected random order. This was recorded on Phillips Cassette tape recorder (type No. N2218). The time was noted with the help of a watch.

Procedure 2 (for spontaneous speech session)

After reading sesaion instructions were given to subjects for spontaneous speech session.

Instructions to subjects.

"Now you have to talk in English for five minutes about your past experience. So think and prepare yourself for speech. Please start when I say 'start'. Stop speaking when I say 'stop'.

After reading session, with an interval of five minutes, spontaneous speech was recorded on the same tape recorder, for five minutes.

Section 2.

Condition immediately after anesthetization of palate.

Instructions to subjects.

"Now you are going to receive two injections on the palate by the dental surgeon. It will anesthetize your palate and later you will have to read and speak in English".

To anesthetize palate, 'bilateral posterior palatine' *injections were given by a dental surgeon. Injections were given to the middle and posterior branches of the medial and posterior nasopalatine nerve to produce anesthetic effect.

The sensation of touch and pain were tested by the surgeon and when the subject was not feeling any pain/sensation of touch at the palate, the second reading material was given for reading. He could move articulators freely, indicating no severe motor paralysis. The procedure was same as procedure 1 & 2 in section 1 of experiment number 1. And thus both reading and spontaneous speech were recorded for 5 minutes each.

*Posterior palatine injection: Technique involves of inserting the needle into the posterior palatine at an angle of 45° with occlusal plane of the upper teeth, into the posterior palatine foramen from the opposite side. The needle is first aspirated to eliminate any air bubble and brought parallel to the alveolar plate of the same side. Then the needle is pushed into the posterior palatine foramen and the xylocaine 2% solution is injected there. Palatal alveolar plate also gets anesthetized. 5 c.c. syringe with 22 gauge needle was used for the above purpose.

Section 3.

Condition one hour after anesthetization of palate. In this condition subjects still felt a mild anesthetic effect and complete recovery was not reported.

Here third reading material was given.

The procedure followed was same as procedure 1 in section 1 of the experiment No. 1.

t

For spontaneous speech recording procedure same as procedure 2 in section 1 of the experiment No. 1 was used.

Section 4.

Condition after complete recovery from anesthetic effect. Subjects were asked whether they have recovered from anesthetic effect. After test for touch and pain, when the subjects reported that he has gained sensation, fourth reading material was given for reading. Subject 'S' took 2Y2 hours and 'N' took 2 hours to recover completely.

Procedure 1 in section 1 of and experiment No. was repeated to record reading.

For apontaneous speech recording, procedure 2 in section 1 of the experiment 1 was repeated. This section is considered as control condition No. 2.

After 48 hours from anesthetization of palate, experiment ; number 2 was conducted i.e., anesthetization of lips only, Interval of 48 hours was given to avoid any possible after-effect from palatal anesthesia.

Experiment No. 2. Anesthetization of lips only.

This experiment also consisted of four sections. Each section had one reading session and one spontaneous speech,each lasting for five minutes as mentioned in experiment No. 1.

Section 1

Condition before anesthetization of lips i.e., control condition No. 1.

Procedure.

Same as procedure 1 & 2 in section 1 of experiment 1. Here fifth reading material was given.

Section 2.

Condition immediately after anesthetization of lips.

Instructions to subjects.

"Now you are going to receive some injections from dental surgeon. It will anesthetize your lips and later you have to read and apeak, like in the previous experiment".

To anesthetize upper lip, 'bilateral infraorbital'* injections were used by the dental surgeon. Lower lip was anesthetized by using infiltration technique. Xylocaine 2% solution diffuses through tissues reaching incisive branch of inferior alveolar nerve and combining with protoplasm of the nerve cells of lower lip.

*Infraorbital injection : Needle is directed from above the second bicusbid tooth as high as possible to reach infraorbital foramen. After the needle has reached the infraorbital foramen, syringe is aspirated to avoid air bubble and xylocaine 2% solution is slowly injected. Directly or by diffusion, it reaches the infraorbital canal and anesthetizes the anterior, superior alveolar middle and posterior alveolar nerves. Along with anesthetization of upper lip, nose part of lower eyelids also will be anesthetized due to anesthetization of the terminal brances of infraorbital nerve namely the nasal,labial and palpebral.

The sensation of touch and pain were tested by the surgeon and when the subject was not feeling any pain/sensation of touch on lips, the sixth reading material waa given. He was able to move lips and other articulators freely, indicating no severe motor paralysis.

Procedure.

Same as procedure 1 & 2 in aection 1 of experiment No. 1.

Section 3.

Condition one hour after anesthetization of lips. In this condition, subject still felt mild anesthetic effect on lips and complete recovery was not reported.

Procedure.

Same aa procedure 1 & 2 in section 1 of the experiment No.1 was repeated. Here seventh reading material has given.

Section 4.

Condition after complete recovery from anesthetic effect from lips i.e., control condition No. 2.

Procedure.

Same as procedure 1 & 2 section 1 of experiment 1. Here eighth reading material was given.

PART 3.

Analysis.

After all experiments, the recorded materials were played to three judges, using the same tape recorder (Phillips Type N2218). Judges were final year undergraduates in Speech Pathology and Audiology, who had completed their course in stuttering.

The judges were not aware of the experimental procedures or the purpose of the experiment. To provide no cues to judges regarding experimental procedures, recorded materials had only their section numbers and experiment numbers.

Instructions to judges.

"Now you are requested to count number of speech blocks of two speakers whose speech materials are recorded on tapes. Please listen to tapes and note down the number of blocks in the score sheet given to you". Model score sheet is given in appendix. 1.

"Then tapes will be played back and you please identify and note down the number of blocks specifically in terms of prolongations, repetitions and pauses in the specific score sheet given to you". Model score sheet is given in Appendix 2.

Recordings were played to each of them separately in a silent room. The judges were requested to count blocks as per the definitions given (Appendix 3). Recordings were played to judges, only when they felt comfortable to listen to tapes.

Later, all spontaneous speech of subjects ware transcribed by the experimenter and number of syllables spoken, were counted and from reading materials, number of syllable read were counted.

Average number of blocks given by judges were taken for analysis.

CHAPTER IV

RESULTS AND DISCUSSION

Analyaia was done from the scores given by the judges.

SUBJECT S : Experiment No. 1. Anesthetization of Palate only.

Table 1 shows the average number of blocks as noted by the judges in both reading and apontaneous speech sessions for subject S, stutterer, under palatal anesthesia.

Table 1

Frequency of blocks (Anesthetization of palate!

Condition	Reading	Spontaneous speech
Section 1	55.00	56.33
Section 2	38.66	35.00
Section 3	38.00	36.66
Section 4	56.00	59.33

Table 2 ahowa the average number of blocksin terms of prolongations, repetitions and pauases as noted by the judges for reading and spontaneous speech sessions.

Table 2

Frequency of blocks in terms of prolongations. repetitions and pauses (Anaestization of Palate)

Type of blocks stuttering	Section 1		Section 2		Section 3		Section 4	
	Reading	Spontaneous speech	Reading	Spontaneous speech	Reading	Spontaneous speech	Reading	Spontaneous speech
Prolongation	11.33	9.33	6.33	6.33	9.66	7.33	7.33	7.33
Repetition	32.33	39.65	27.00	31.33	23.99	25.99	35.65	37.99
Pause	15.66	10.33	4.00	5.00	4.33	4.66	10.33	12.00
Total	59.32	59.31	37.33	42.66	37.98	37.98	53.31	57.32

The frequency of blocks from two conditions i.e., before classifying blocks into prolongations, repetitions and pauses and after classification are computed for correlation co-efficient. It is found to be 0.94 which is significant at 0.01 level. This high correlation between these two sets of scores shows that the judges are highly consistent 36 identifying the blocks.

Inter judge reliability is also checked. Correlation co-efficient is found between following sets viz., between the judges 1 and 2; between the judges 2 and 3; and between the

the judges 1 and 3. The correlation co-efficient is given below in table 3. These scores are significant at 0.01 level.

Table 3

Inter judge reliability (Anesthetization of palate

Sets	Correlation co-efficient
Between judges 1 and 2	0.91
Between judges 2 and 3	0.95
Between judges 3 and 1	0.94

Thus the scores noted by the judges are found to be reliable and hence valid.

Number of blocks noted in section 1 of experimental condition is same as in sessions prior to the experiment. This is shown in table 4.

Table 4

Frequency of blocks before and during experimentation (Anesthetization of palate

Observer	Condition	Number of blocks/ 5 minutes in reading	Number of blocks/ 5 minutes in apontaneous reading
Experimenter	10 days before expt.	56	57.2
	Immediately before experiment.	53	56.00
3 Judges	Experimental condition(Sec.1)	55	56.33

Thus the study of the table shows that :

1. The judgement made by the experimenter and the three judges in noting the stuttering blocks has been same and,

2. The stuttering has not shown any appreciable change before introduction of anesthesia.

Table 5 shows the number of blocks under experimental and pre experimental conditions.

Table 5

Frequency of blocks under experimental and pre–experimental conditions (Anesthetization of palate)

Conditions	10 days before expt.	immediately before expt.	Experimental conditions (Sections) 1	2	3	4
Reading	56.00	53.00	55.00	38.66	38.00	56.00
Spontaneous speech	57.20	56.00	56.33	35.00	34.66	59.33

From this table it is evident that there is reduction in number of blocks under palatal anesthesia in both reading and spontaneous speech conditions.

A comparison of scores obtained under different conditions shows that the stuttering blocks are constant in pre-experiment conditions and control condition (Section 1). And it can also be seen that number of blocks reduced only in 'anesthetic effect' conditions (Sections 2 and 3). Frequency of blocks increased after complete recovery from anesthesia i.e., the number of blocks in control condition 2 (Section 4) is equal to the scores under pre-experimental conditions and control condition 1 (Section 1). These findings reveal that reduction in number of blocks is contingent with effect of anesthesia. This is also shown in graph 1.

Along with reduction in frequency of blocks, increase in syllable output is also seen. Table 6 shows the changes in syllable output in different conditions.

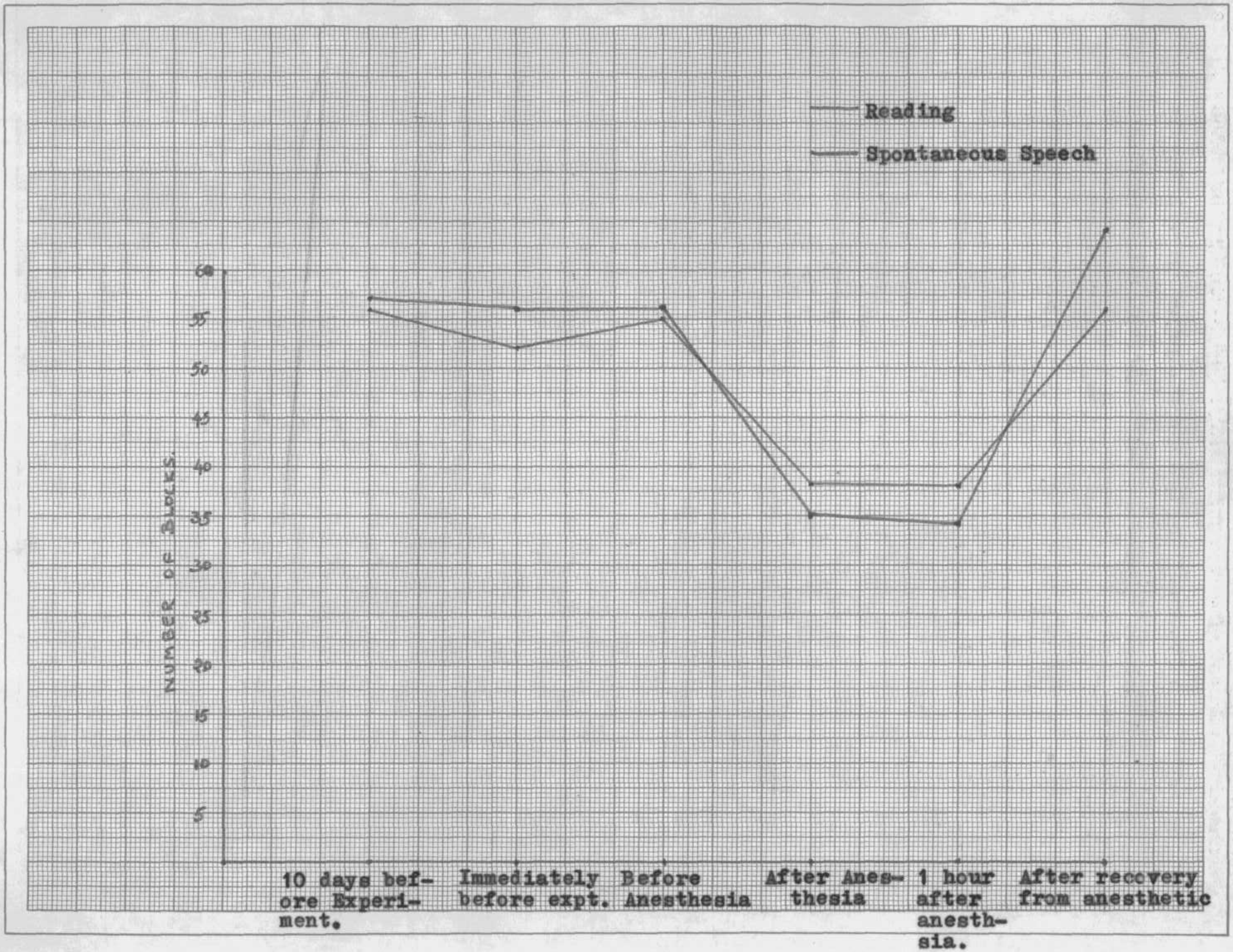
'

Table 6

Syllable output under palatal anesthesia
(Syllables/minute)

condition	Reading	Spontaneous speech
Section 1	73.8	53.2
Section 2	93.2	62.2
Section 3	86.2	53.8
Section 4	64.4	50.4

Showing reduction in stuttering after palatal anesthesia



GRAPH. 1.

From the table 6, it ia evident that syllable output has increased by 19.4 syllables/minute in reading and by 9 syllables/minute in spontaneous speech immediately after introduction of aneathesia to palate (under section 2). Theae values are more than the variation shown by normals (16 ayllables/minute for reading and 7.4 syllables/minute for spontanaous speech under normal conditions

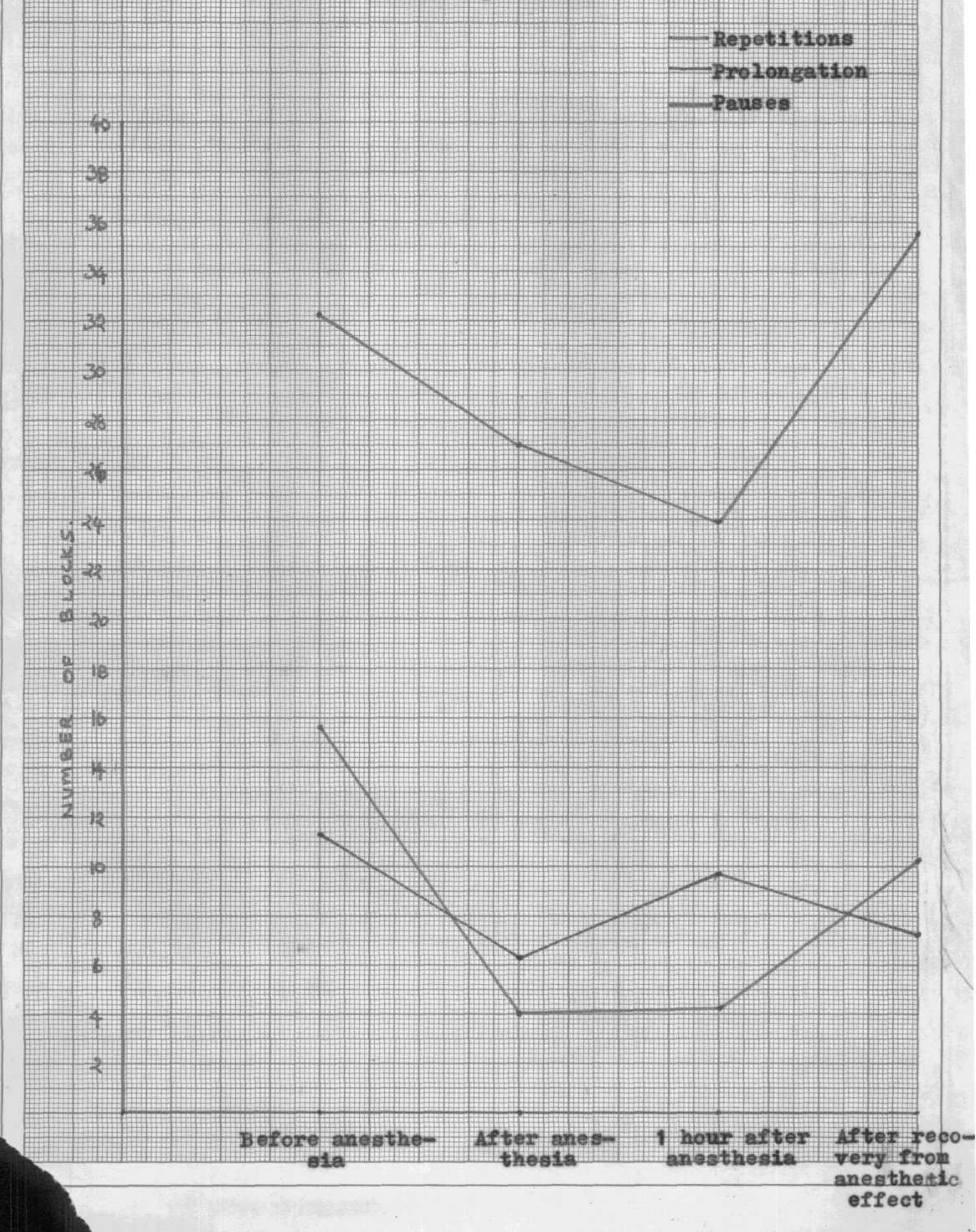
As the table 6 shows, there is increase in syllable output immediately after palatal anesthetization (Section 2) compared to the control condition (Section 1) and decrease in syllable output from the anesthetic condition (section 3) to the control condition 2 (Section 4). These changes confirm that the increas in syllable output after aneathetization is due to the anesthetic effect.

Graphs 2 and 3 ahow the number of blocks in terms of repetitions, prolongations and pauses in reading and apontaneous speech sessions respectively.

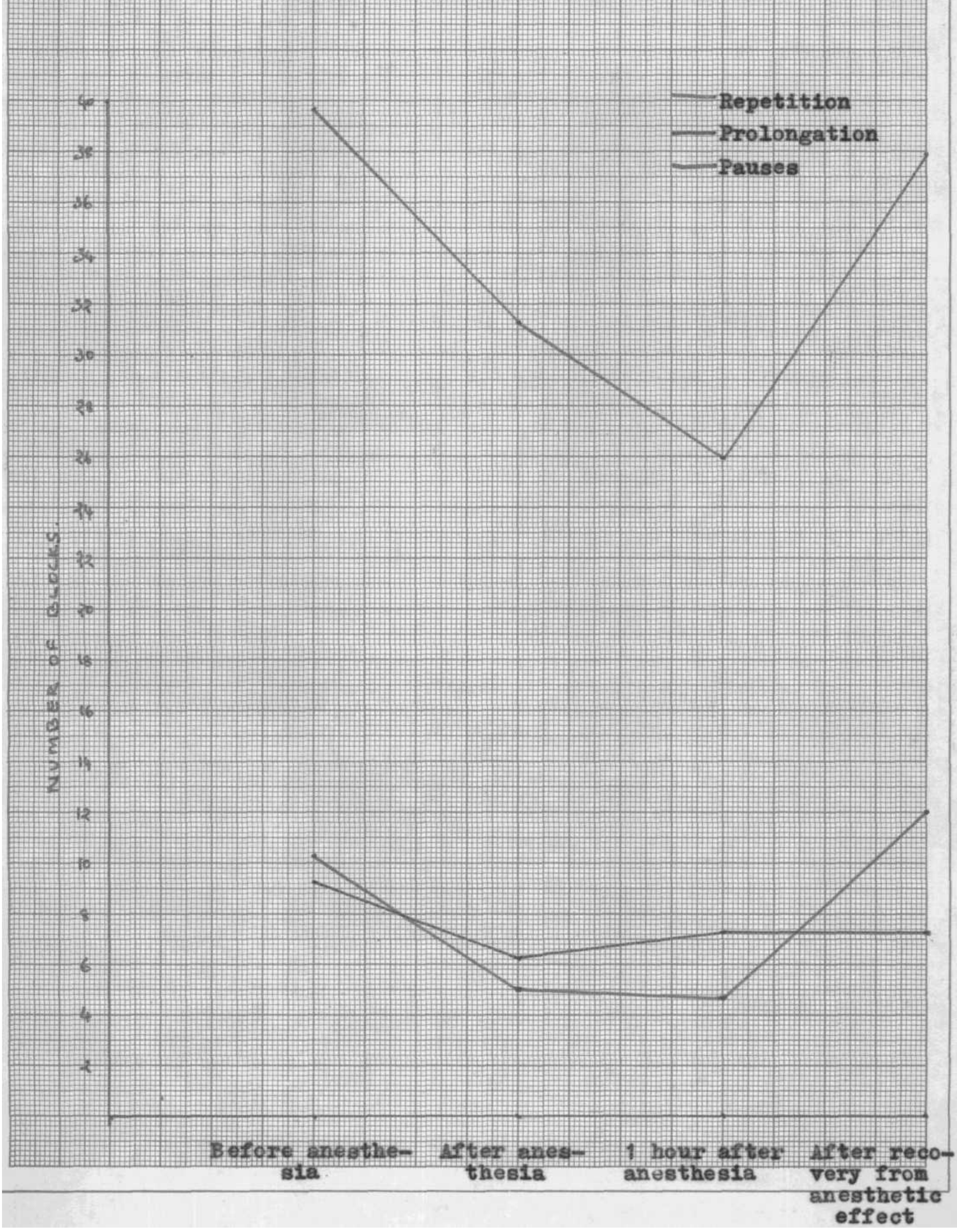
These graphs show that repetition is prominent feature of the subjects stuttering. Repetitions and pause behavior have shown variations under palatal anesthesia, whereas prolongation has not undergone much change even after anesthetization of palate in both reading and spontaneous speech sessions.

GRAPH. 2.

Showing changes in number of blocks in terms of repetitions, prolongations, and pauses under palatal anesthesia in reading session



Showing changes in number of blocks in terms of repetitions, prolongations and pauses under palatal anesthesia in spontaneous speech session.



Experiment No. 2. Anesthetization of live only.

Table 7

Table 7 shows the average number of blocks as noted by the judges in both reading and spontaneous sessions for the subject 'S' under labial anesthesia.

Table 7

Frequency of blocks (Anesthetization of lips)

Condition	Reading	Spontaneous speech
Section 1	51.00	55.66
Section 2	22.66	35.66
Section 3	31.00	35.66
Section 4	50.33	53.33

Table 8 shows the average number of blocks in terms of prolongations, repetitions and pauses as noted by the judges for reading and spontaneous speech sessions.

Table 8

Frequency of blocks in terms of prolongations, repetitions and pauses (Anesthetization of lips)

Type of blocks Stutte-ring	Section 1		Section 2		Section 3		Section 4	
	Reading	Sponta-neous speech	Reading	Sponta-neous speech	Reading	Sponta-neous speech	Reading	Sponta-neous speech
Prolon* gation	6.33	5.33	8.33	4.00	6.66	3.00	8.33	4.33
Repeti-tion	30.99	34.66	8.66	13.32	10.66	21.65	27.65	32.33
Pauses	14.33	17.00	10.66	8.33	13.33	9.33	15.00	15.00
Total	51.65	56.99	27.65	25.65	30.65	33.98	50.98	51.66

The correlation co-efficient between the frequency of blocks under two conditions i.e., before classifying blocks into prolongations, repetitions and pauses and after classification has been computed. A high correlation of 0.93 which is significant at 0.01 level shows that judges are highly consistent in identifying blocks.

Again inter judge reliability was checked for labial anesthetic conditions. The correlation co-efficient between the judges is given in table 9. These scores are significant at 0.01 level.

Table 9

Inter judge reliability (Anesthetization of lips

Seta	Correlation co-efficient
Between judges 1 and 2	*-0.91
Between judges 2 and 3	0.95
Between judges 3 and 1	0.94

'Thus the score noted by the judges were found to be reliable and hence valid.

Table 10 shows the changes in frequency of blocks in various condition.

Table 10

Condition	10 days before expt.	Immediately before expt.	Experimental conditions (sections)			
			1	2	3	4
Reading	56.00	53.00	51.00	22.66	31.00	50.33
Spontaneous speech	57.20	56.00	55.66	35.66	35.66	53.33

Table 10 shows reduction in number of blocks under labial anesthesia in both reading and spontaneous speech conditions. The consistency in stuttering under 'non-anesthetic' conditions and reduction in stuttering under anesthetic conditions shows that the reduction is due to anesthetic effect i.e., reduction in frequency of blocks is contingent with introduction of anesthetic effect. Further a sudden increase in number of blocks after complete recovery (section 4) when compared to condition under anesthetic effect (section 3) confirms the contingent effect of anesthesia. This is shown in graph 4 also.

Along with the reduction in stuttering frequency, increased rate of syllable output is seen under labial anesthesia also. Table 11 shows the changes in rate of syllable output (syllables/minute) in different conditions.

Table 11

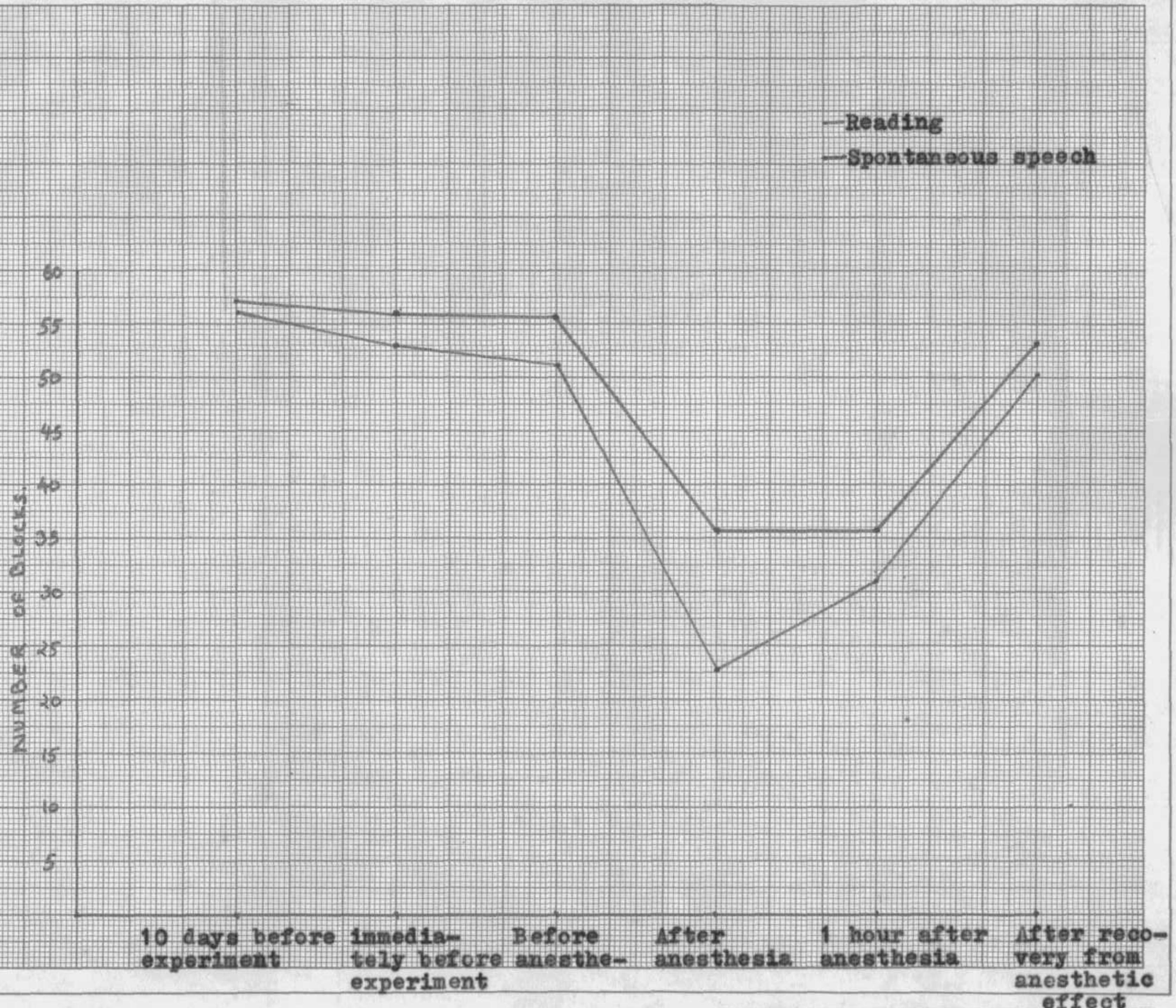
Syllable output under labial anesthesia (syllables/minute)

Conditions	Reading	Spontaneous speech
Section 1	75.2	58.4
Section 2	96.2	92.0
Section 3	79.6	81.2
Section 4	73.6	62.6

The table 11 shows high rate of syllable output immediately after labial anesthesia (section 2) both in reading and sponta-

GRAPH. 4.

Showing reduction in stuttering after labial anesthesia



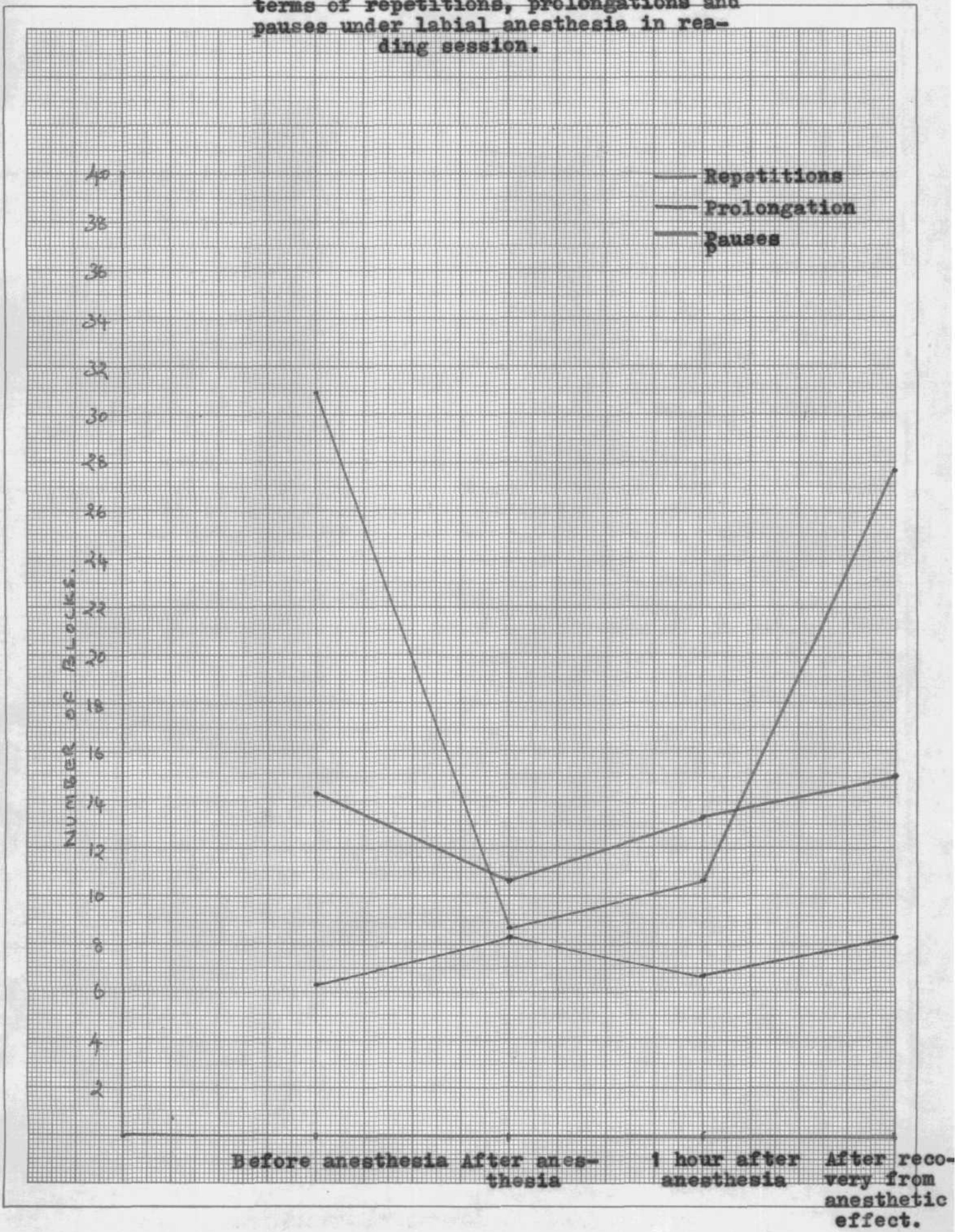
neous speech sessions. The reading rate has increased by 21 syllables/minute and speech rate by 33.6 syllables/minute under labial anesthesia. These values are more than the variation shown by normal under normal conditions (Via., 16 syllables/minute for reading and 7.4 syllables/minute for spontaneous speech).

As the table 11 shown, there is increase in syllable output immediately after labial anesthetization (section 2) compared to the control condition 1 (section 1) and decrease in syllable output from the anesthetic condition (section 3) to the control condition 2 (section 4). These changes confirm that the increase in syllable output after anesthetization is due to the anesthetic effect.

Graphs 5 and 6 show the number of blocks in terms of repetitions, prolongations and pauses for reading and spontaneous speech sessions respectively.

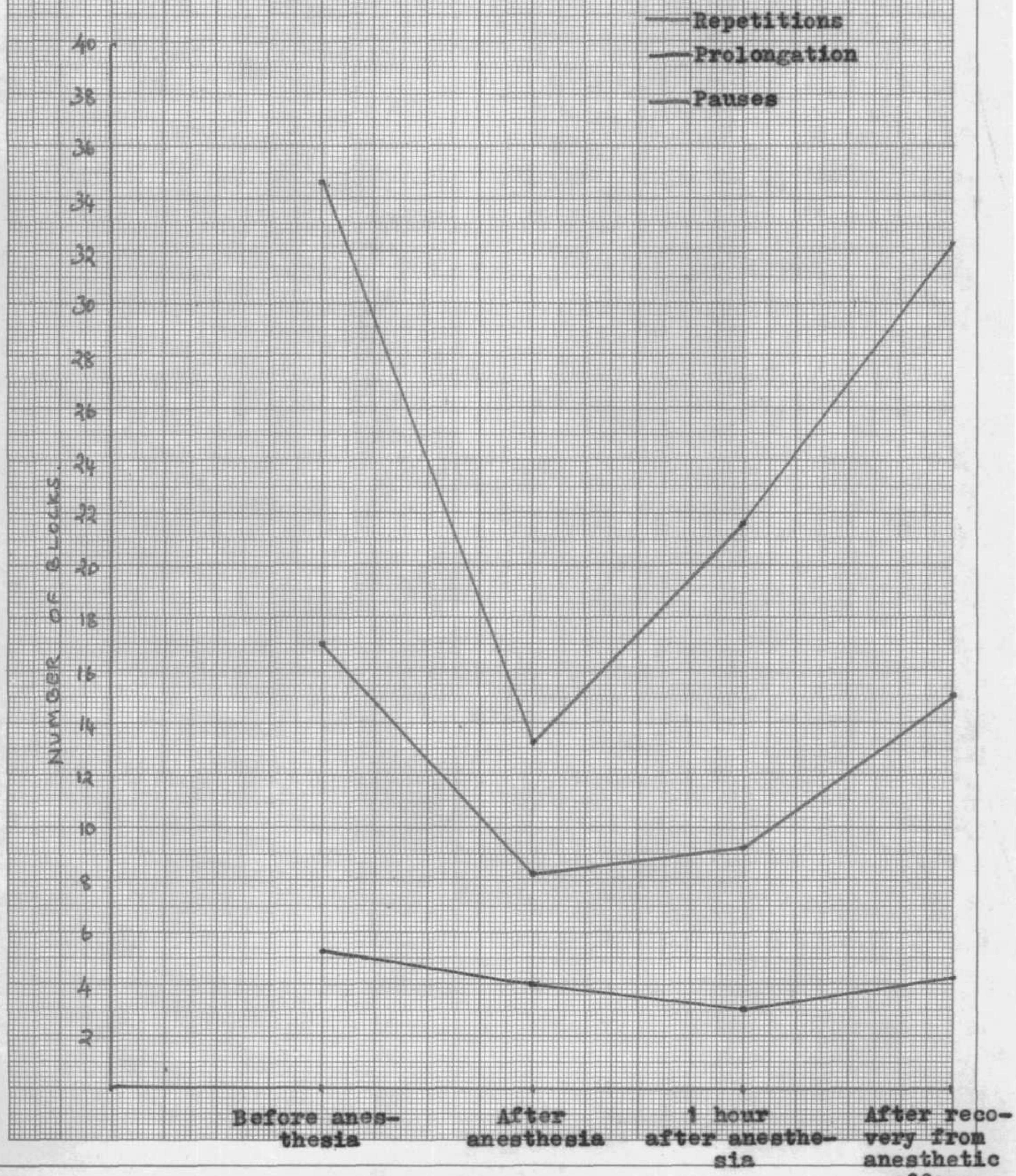
These graphs show again repetition as a prominent feature of stuttering and this has undergone maximum changes. Though slight changes are seen in number of pauses, prolongation has not shown variation in reading and spontaneous speech under experimental conditions.

Showing changes in number of blocks in terms of repetitions, prolongations and pauses under labial anesthesia in reading session.



GRAPH.B.

Showing changes in number of blocks in terms of repetitions, prolongations and pauses under labial anesthesia in spontaneous speech session



SUBJECT 'N' : Experiment No. 1. Anesthetization of Palate only.

The judges have noticed 1.66 blocks on the average in the reading and spontaneous speech of the normal subject in non-anesthetic condition (control condition 1 i.e., section 1). Further they have also noticed 12.33 and 10.00 blocks in reading and spontaneous speech respectively under the anesthetic condition (section 2). Under section 3 (i.e., after 1 hour of anesthetization) they have found 7.66 and 6.66 blocks in reading and spontaneous speech respectively. This can be seen in table 12.

Table 12

Frequency of Blocks)(Anesthetization of blocks

Conditions	Reading	Spontaneous speech
Section 1	1.66	1.66
Section 2	12.33	10.00
Section 3	7.66	6.66
Section 4	0.00	0.00

Table 13 shows the average number of blocks in terms of of prolongations, repetitions and pauses as noted by the judges in reading and spontaneous speech sessions.

Table 13

Frequency of blocks in terms of prolongations. repetitions and pauses (Anesthetization of palate)

Type of block	Sect:ion 1		Section 2		Section 5		Section 4	
	Reading	Sponta-neons speech	Reading	Sponta-neous speech	Reading	Sponta-neous speech	Reading	Sponta-neous speech
Prolonga-tion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repeti-tion	0.66	0.66	6.6	5.66	4.00	2.66	0.33	0*00
Pauses	1.00	1.00	5.33	4.00	3.33	2.33	0.00	0.00
Total	1.66	1.66	11.99	9.66	7.33	4.99	0.33	0.00

As in the previous experiments intra and inter judge reliabilities are computed. Intra judge reliability is found to be 0.96 which is significant at 0.01 level. Inter judge reliability ia also high and it is given in the table 14. These scores are significant at 0.01 level.

Table 14

Inter judge reliability (Anestheti-zation palate)

Sets	Correlation co-efficient
Between judges 1 and 2	0.93
Between judges 2 and 3	0.96
Between judges 3 and 1	0.95

Thus the scores noted by the judges even for nomals, both in reading and spontaneous speech are found to be reliable. And hence the scores are considered valid.

A study of the table 12 reveals the effect of palatal anesthesia on fluency in normal subject during reading and speaking sessions. The normal subject has shown blocks both in reading and speech. This is also shown in graph 7.

The consistency in normal fluency under 'non-anesthetic' conditions and presence of blocks under 'anesthetic' conditions show that the presence of blocks is due to anesthetic effect. Further a return to normalcy after complete recovery (Section 4) when compared to condition under anesthetic (section 3) confirms the contingent effect of anesthesia.

of

Along with the presence 8 blocks in reading and speaking under palatal anesthesia, subject N has also shown decrease in rate of syllable output. Table 15 shows the changes in rate of syllable output in different conditions.

Showing the presence of number of blocks after palatal anesthesia in normal

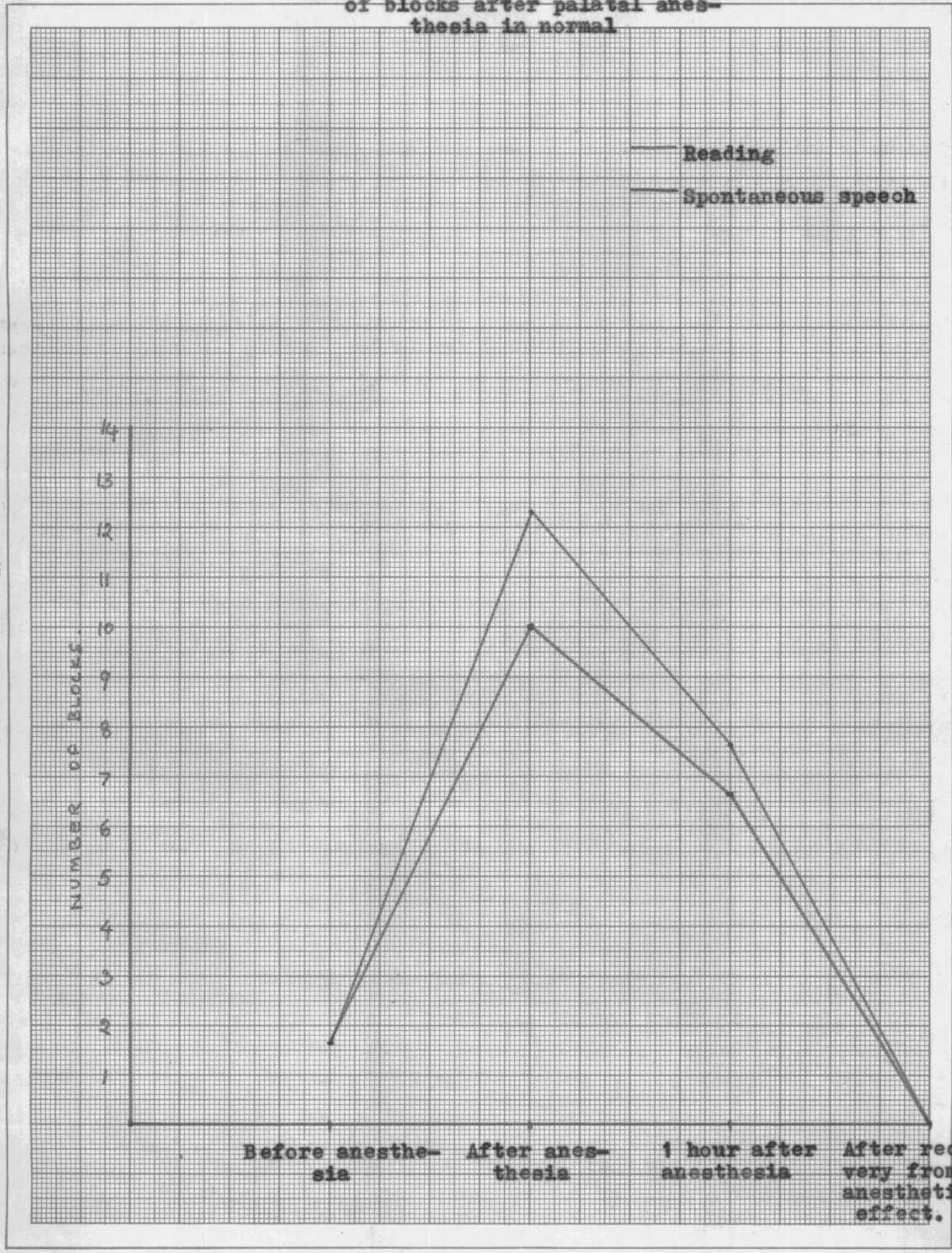


Table 15

Syllable output under palatal anesthesia
(Syllables/minute)

Conditions	Reading	Spontaneous speech
Section 1	225.20	228.50
Section 2	201.20	191.75
Section 3	210.50	194.25
Section 4	220.20	235.00

From the table 15 there is a decrease of 23.6 syllables/minute in reading rate and 36.75 syllables/minute in speech rate after anesthetizing palate. These values are more than the changes shown by normals (16 syllables/minute for reading and 7.4 syllables/minute for spontaneous speech) under normal condition.

As the table 15 shows, there is decrease in syllable output immediately after palatal anesthetization (section 2) compared to the control condition 1 (section 1) and increase in syllable output from the anesthetic condition (section 3) to the control condition 2 (section 4). These changes confirm that the decrease in syllable output after labial anesthetization is due to the effect of labial anesthesis.

The judges have noted only repetitions and pauses and not prolongation in normal subject after anesthetization. Graphs 8 and 9 show number of blocks in terms of repetitions, and pauses in reading and spontaneous speech respectively.

Experiment 2. Anesthetization of lips.

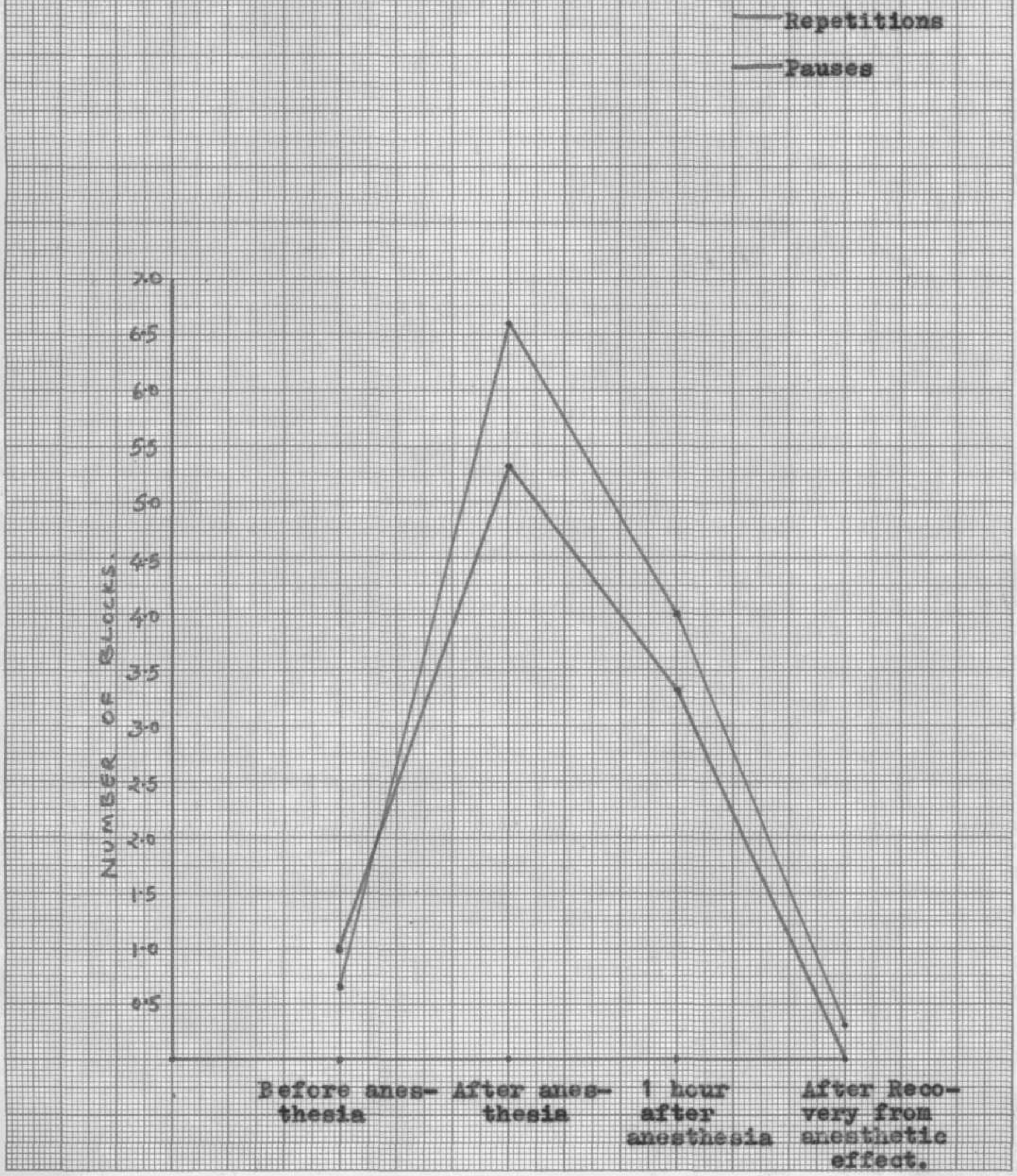
The judges have noticed blocks in normal subject under labial anesthesia also. The number of blocks noted in different condition is given in the table 16.

Table 16
frequency of blocks (Anesthetization of lips)

Condition	Reading	Spontaneous speech
Section 1	0.33	0.00
Section 2	13.33	11.33
Section 3	8.33	7.00
Section 4	0.00	0.00

Table 17 shows the average number of blocks in terms of prolongations, repetitions and pauses as noted by the judges in reading and spontaneous speech sessions.

Showing the presence of number of blocks in terms of repetitions and pauses after palatal anesthesia in reading session of normal.



GRAPH-4.

Showing the presence of number of blocks in terms of repetitions and pauses after palatal anetehesia in spontaneous speech session of normal

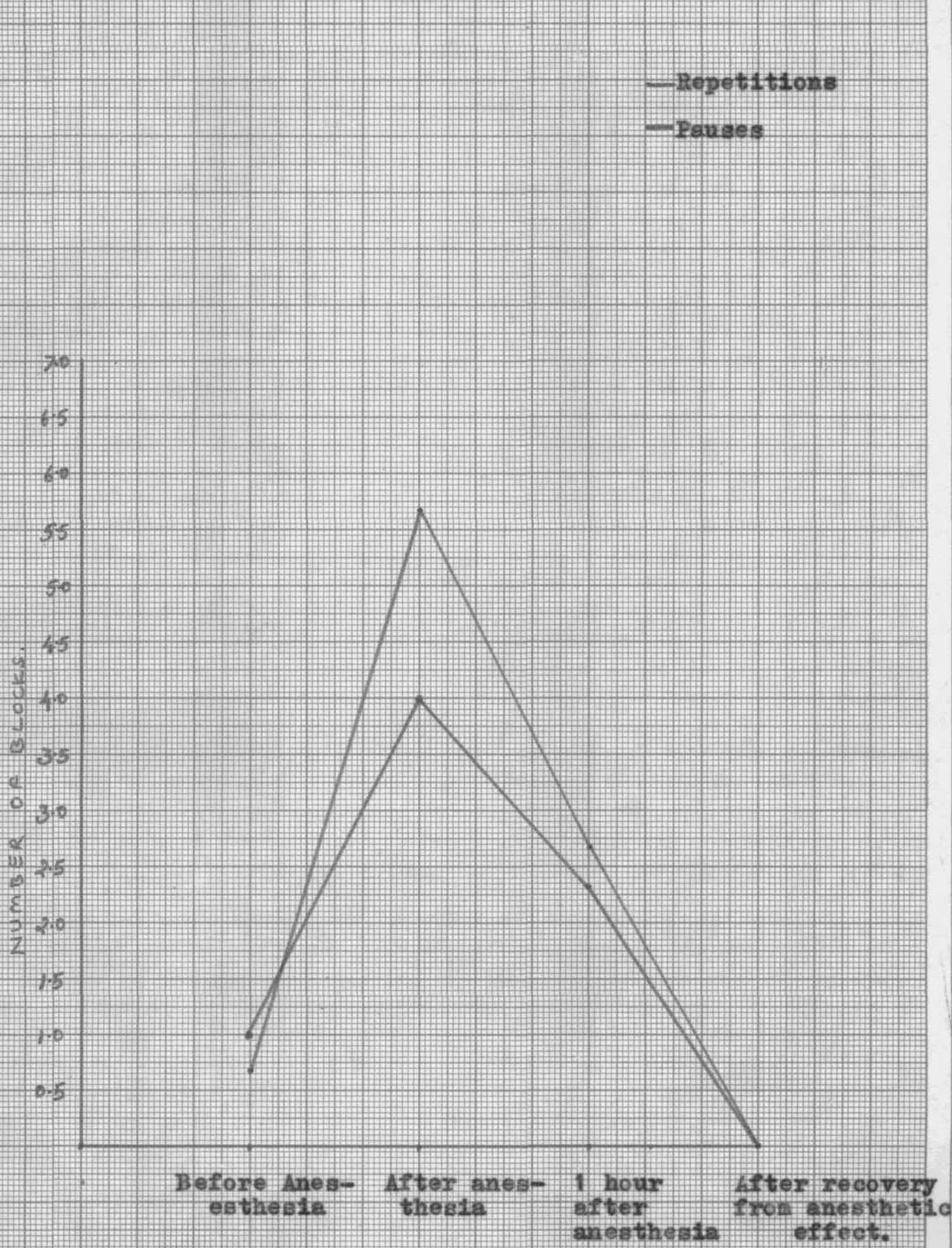


Table 17

Frequency of blocks in terms of repetitions. prolongations and pauses (Anesthetization of lips

Type of blocks	Section 1		Sect!on 2		Section 5		Section 4	
	Reading	Sponta- neous speech	Reading	Sponta- neous Speech	Reading	Sponta- neous speech	Reading	Spont*- neoua speech
Prolonga- tions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repetitions	0.66	0.00	9.99	7.30	6.32	3.00	0.00	0.00
Pauses	0.00	0.00	3.66	3.30	1.00	2.66	0.00	0.00

As in previous experiments, intra and inter judge reliabilities are computed. Intra judge reliability is found to be 0.95, significant at 0.01 level. Inter judge reliability is also high and it is given in the table 18. These scores are significant at 0.01 level.

Table 18

Inter judge reliability(Anesthetization of palate)

Sets	Correlation Co-efficient
Between judges 1 & 2	0.92
Between judges 2 & 3	0.94
Between judges 3 & 1	0.93

Thus the scores are found to be reliable and hence valid.

A study of the table 16 shows the effect of labial anesthesia on fluency in normal subject during reading and speaking sessions. The normal subject has shown blocks both in reading and speech. This is shown in graph 10 also.

The consistancy in normal fluency under 'non-anesthetic' conditions and presence of blocks under 'anesthetic' conditions show that the presence of blocks is due to anesthetic effect. Further a return to normalcy after complete recovery (section 4) when compared to condition under anesthetic effect (section 4) confirms the contingent effect of anesthesia.

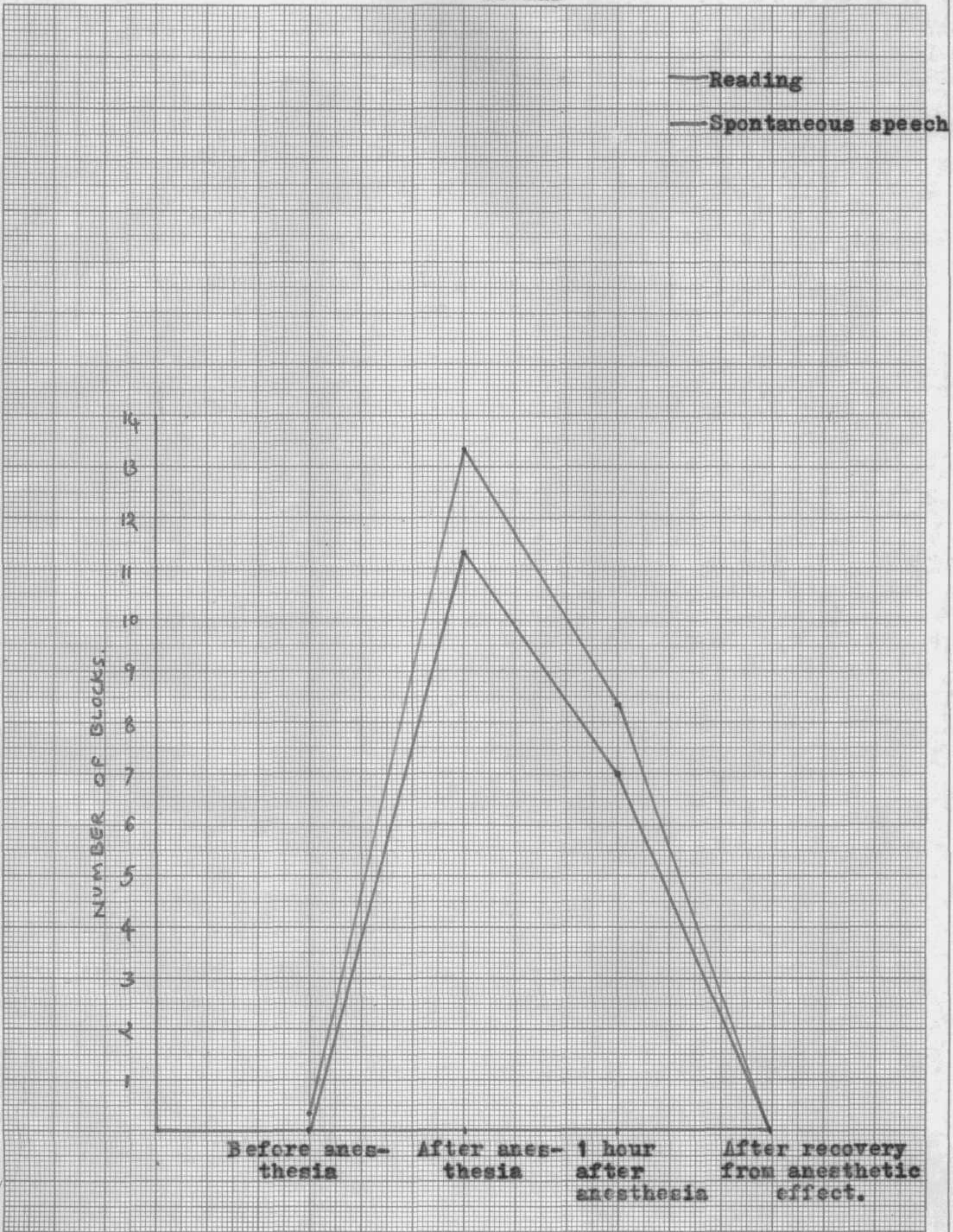
Along with the presence of blocks in reading and speaking under labial anesthesia, decrease in syllable output is also seen. Table 19 shows the changes in rate of syllable output in different conditions.

Table 19

Syllable output under labial anesthesia (Syllables/ minute)

Conditions	Reading	Spontaneous Speech
Section 1	222.50	233.00
Section 2	191.75	208.50
Section 3	196.25	223.00
Section 4	210.00	235.25

Showing the presence of number of blocks after labial anesthesia in normal



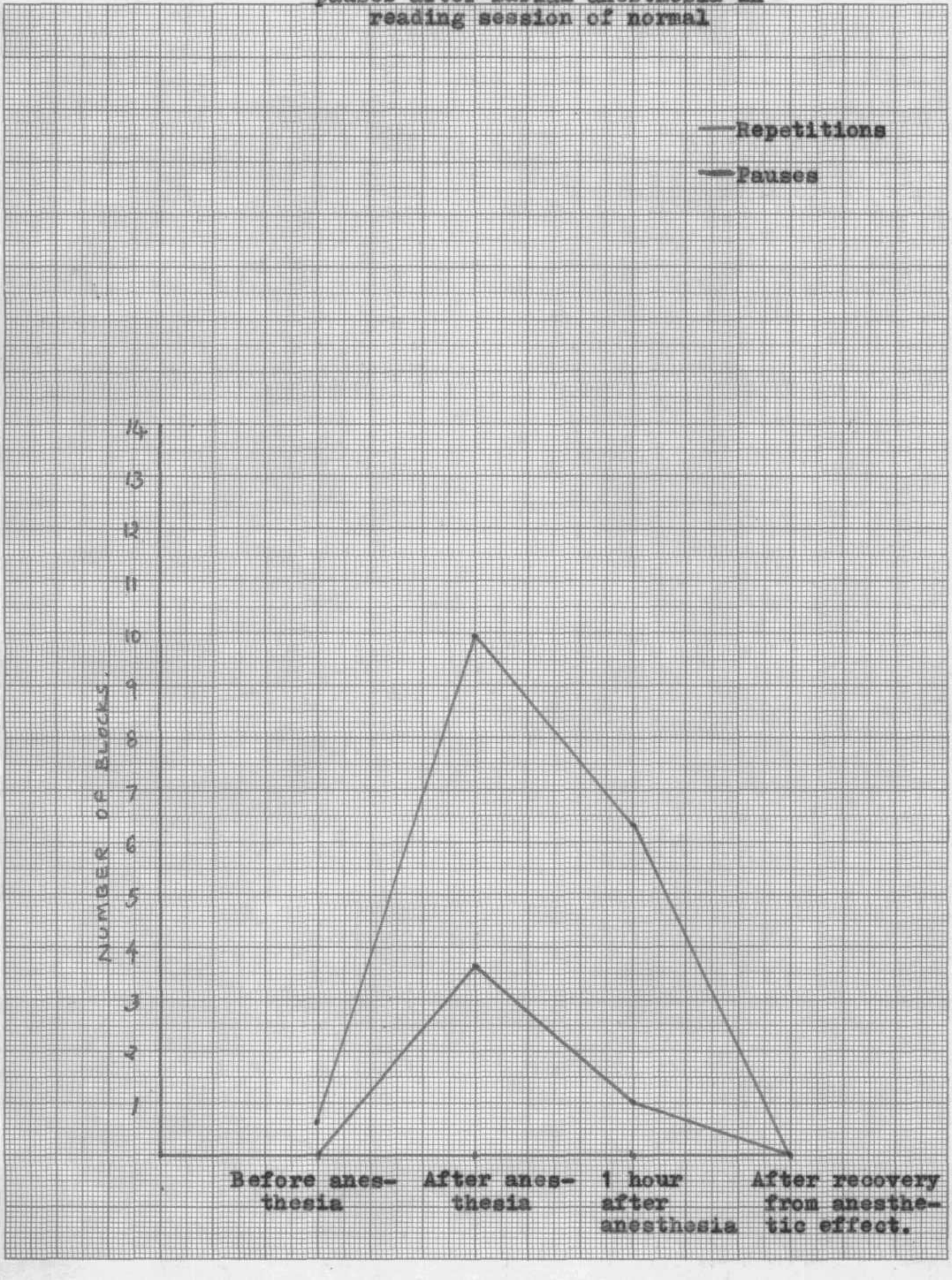
From the table 19 it is evident that the reading rate has decreased by 30.75 syllables/minute and speech rate by 24.50 syllables/minute after anesthetization of lips. These values are more than the variation shown by normals (16 syllables/ minute for reading and 7.4 syllables for spontaneous speech) under normal conditions.

Table 19 shows decrease in syllable output immediately after labial anesthetization (section 2) compared to control condition 1 (section 1) and increase in syllable output from the anesthetic condition (section 3) to the control condition 2 (section 4). These changes confirm that the decrease in syllable output after labial anesthetization is due to the effect of labial anesthesia.

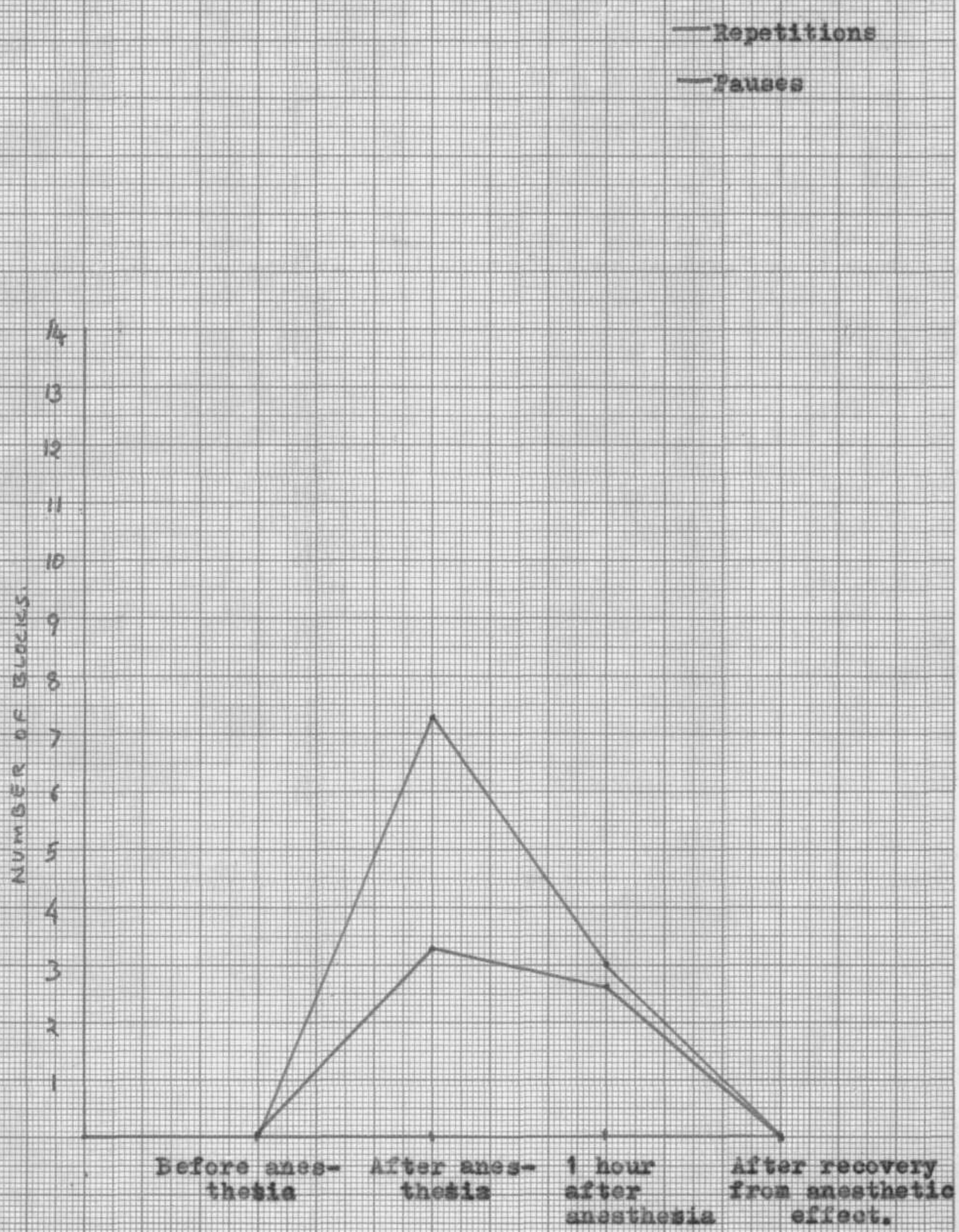
The judges have noted blocks only in the form of repetitions and pauses and not prolongation under labial anesthesia in normal subject. Graphs 11 and 12 show number of blocks in-terms of repetitions and pauses in reading and spontaneous speech respectively.

Thus the results show that there is reduction in stuttering under palatal anesthesia and labial anesthesia. But these findings contradicts Gross's (1964) statement that anesthetization of articulators had no effect on stutterers.

Showing the presence of number of blocks in terms of repetitions and pauses after labial anesthesia in reading session of normal



Showing the presence of number of blocks in terms of repetitions and pauses after labial anesthesia in spontaneous speech of session of normal.

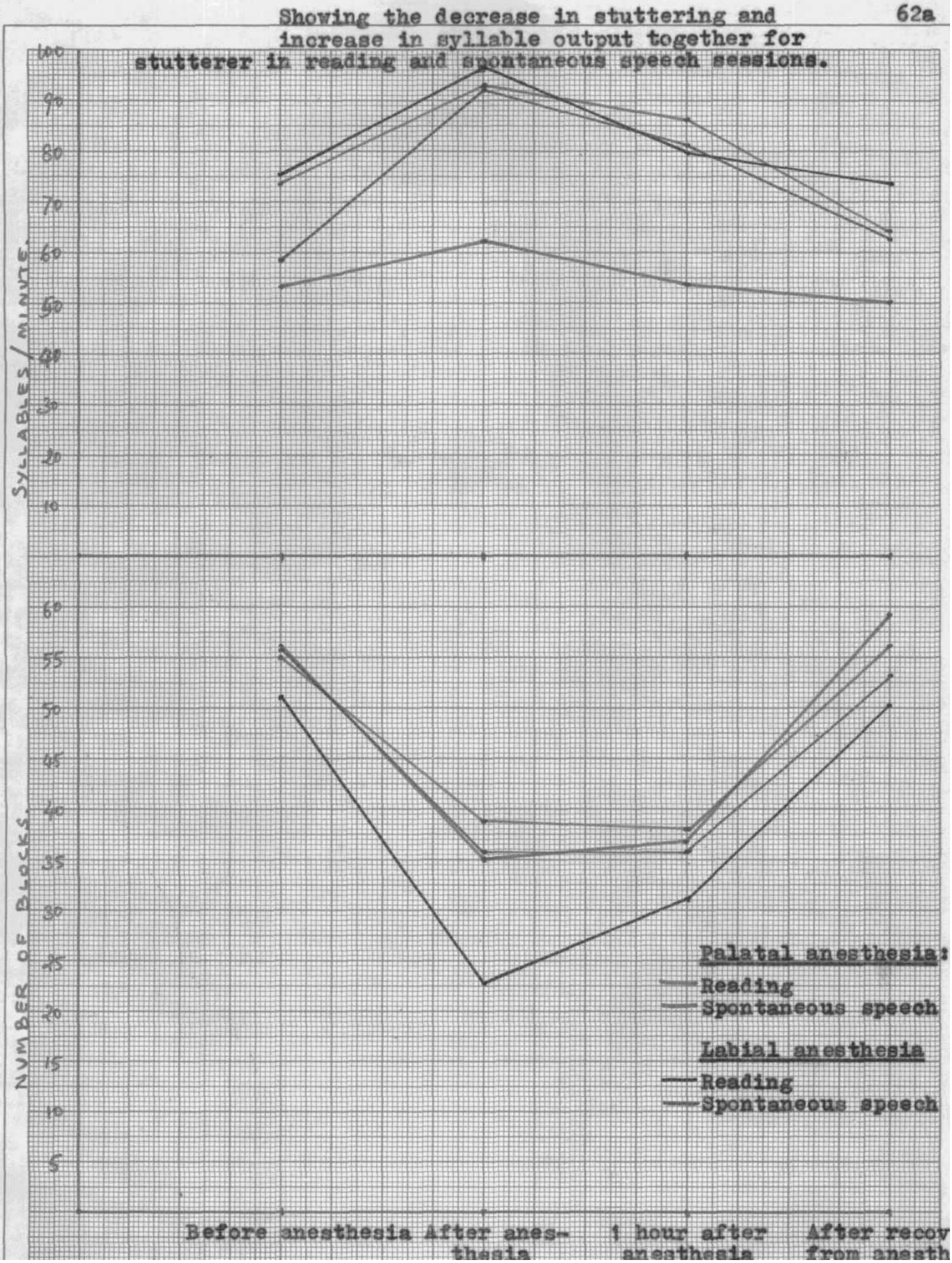


The results of the present study are similar to the results of Manohar et al's (1975) study. They have also reported that there was reduction in stuttering after lingual anesthetization in both reading and spontaneous speech.

As Hutchinson and Ringel (1975) hypothesize that if substantial reduction in stuttering occurs under oral sensory deprivation, it is due to the inability to monitor the articulatory events of the block. So stuttering is within the'peripheral' frame work. The results of the present study supports this hypothesis, as the study shows reduction in stuttering under palatal and labial anesthesia.

Ingham and Andrews (1972) state that any treatment resulting in abnormally slow speech will not be an effective one. And they stress that reduction in the frequency of stuttering should be parallelled by corresponding increase in rate of speech. The present study ahowa an increase in rate of reading and speech (in terms of syllables/minute) along with decrease in stuttering. Graph 13 shows the decrease in stuttering and increase in syllable output (syllables/minute)together for the subject 'S'.

As results show decrease in stuttering under palatal anesthetic condition, the first hypothesis that 'no change in stuttering will be observed when anesthesia is administered only to palate in Stutterer' is rejected.


Showing the decrease in stuttering and increase in syllable output together for stutterer in reading and spontaneous speech sessions.
SYLLABLES / MINUTE
100
90
80
70
60
50
40
30
20
10
NUMBER OF BLOCKS
60
55
50
45
40
35
30
25
20
15
10
5
Palatal anesthesia:
Reading
Spontaneous speech
Labial anesthesia
Reading
Spontaneous speech
Before anesthesia
After anesthesia
1 hour after anesthesia
After recov from anesth

As labial anesthesia produced decrease in stuttering in the subject 'S', the second hypothesis that 'no change in stuttering will be observed when anesthesia is administered only to lips in stutterer' is also rejected.

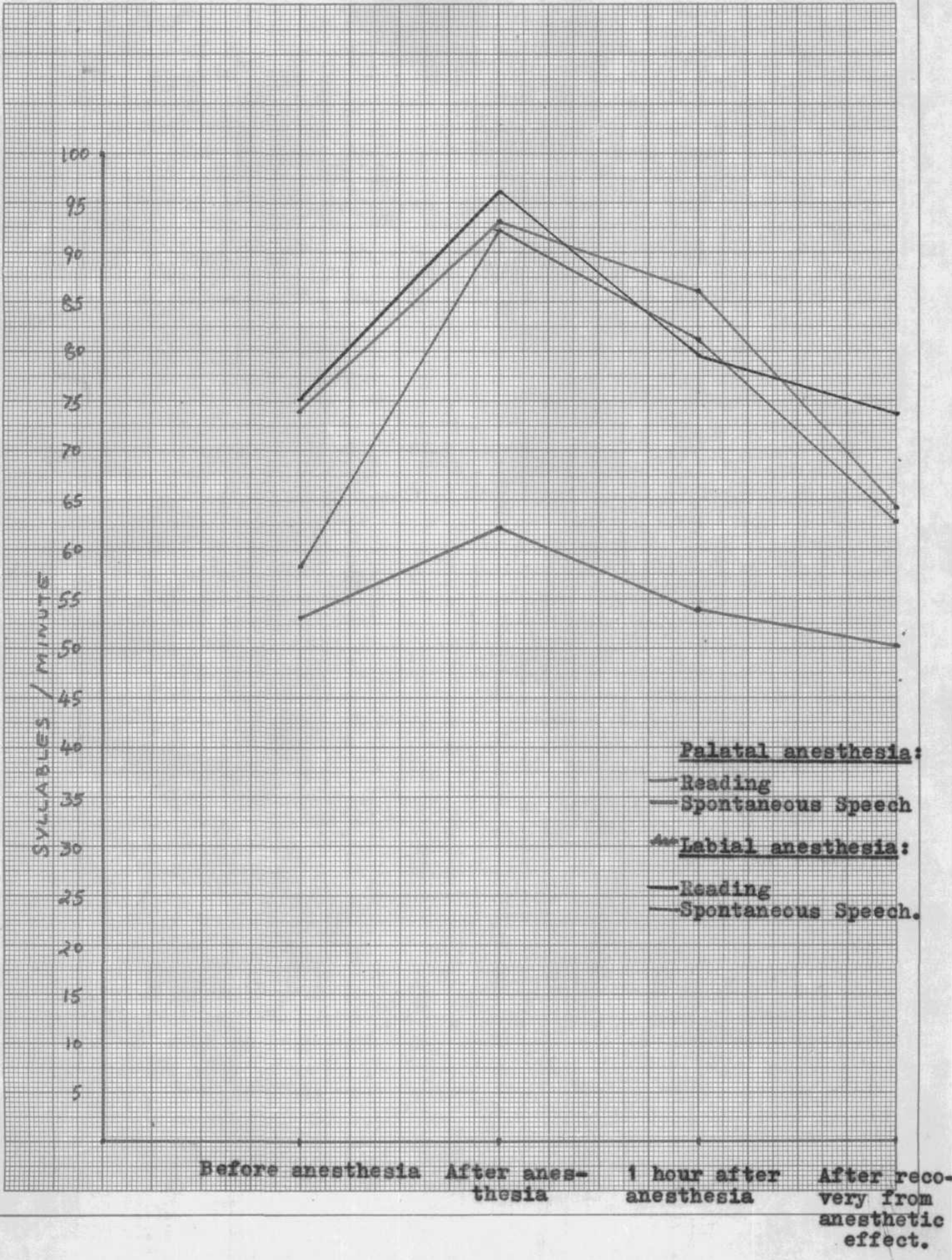
As the palatal and labial anesthesia produced stuttering like behavior in the normal subject, both the hypotheses 3 & 4 which say that no stuttering like behavior will be observed when anesthesia is administered to palate or lips in normal subject, are rejected.

In the present study it has been found that labial anesthesia has produced more increase in syllable output than palatal anesthesia in the subject 'S' stutterer. This is shown in graph 14.

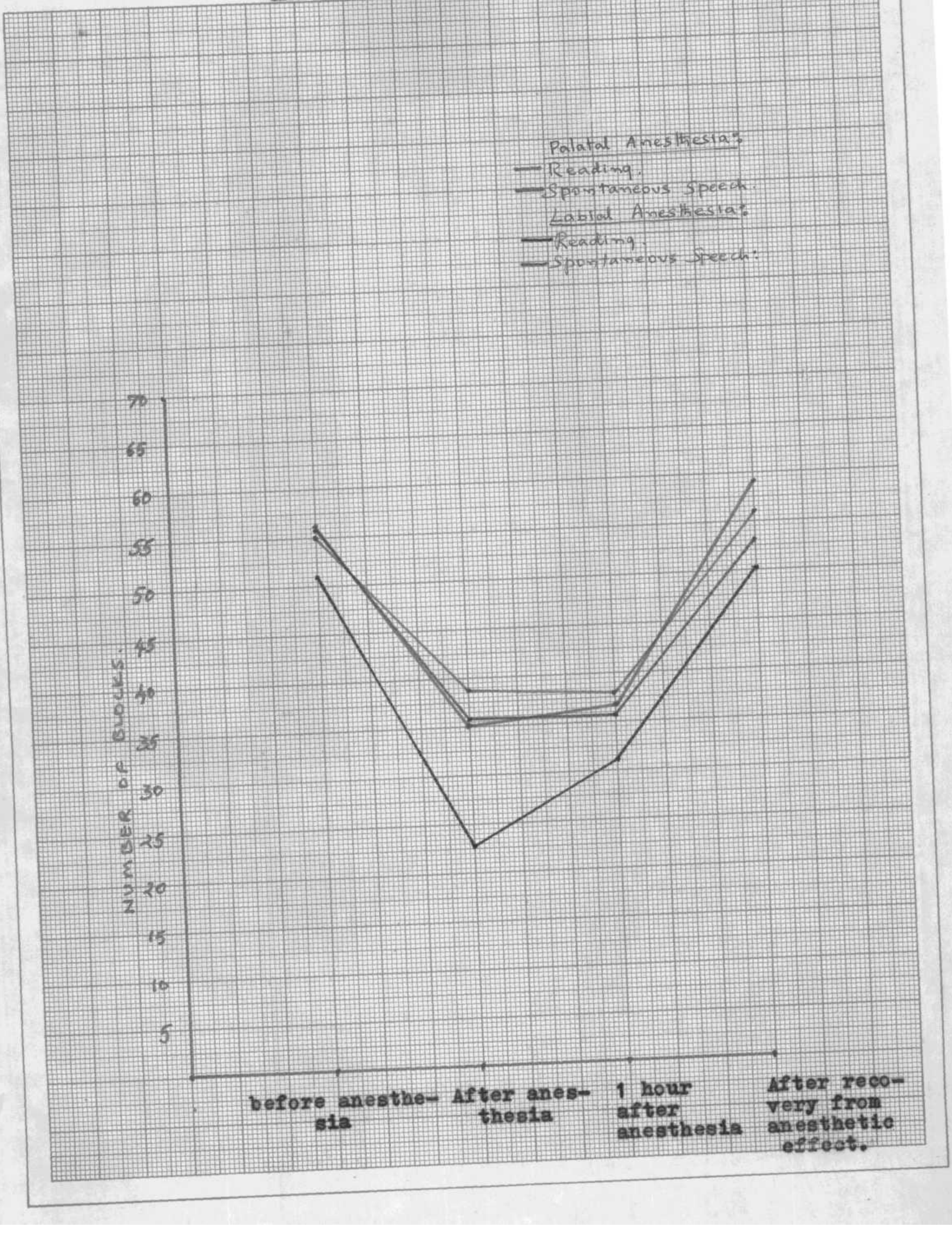
It also has been found that labial anesthesia on stutterer produced more reduction than palatal anesthesia. This is shown in graph 15. In normal subject also labial anesthesia produced more number of blocks than palatal anesthesia. Graph 16 shows this.

The results of the present study thus suggest a possible role played by the tactile and kinesthetic feedbacks from palate and lips in stuttering and normal speech.

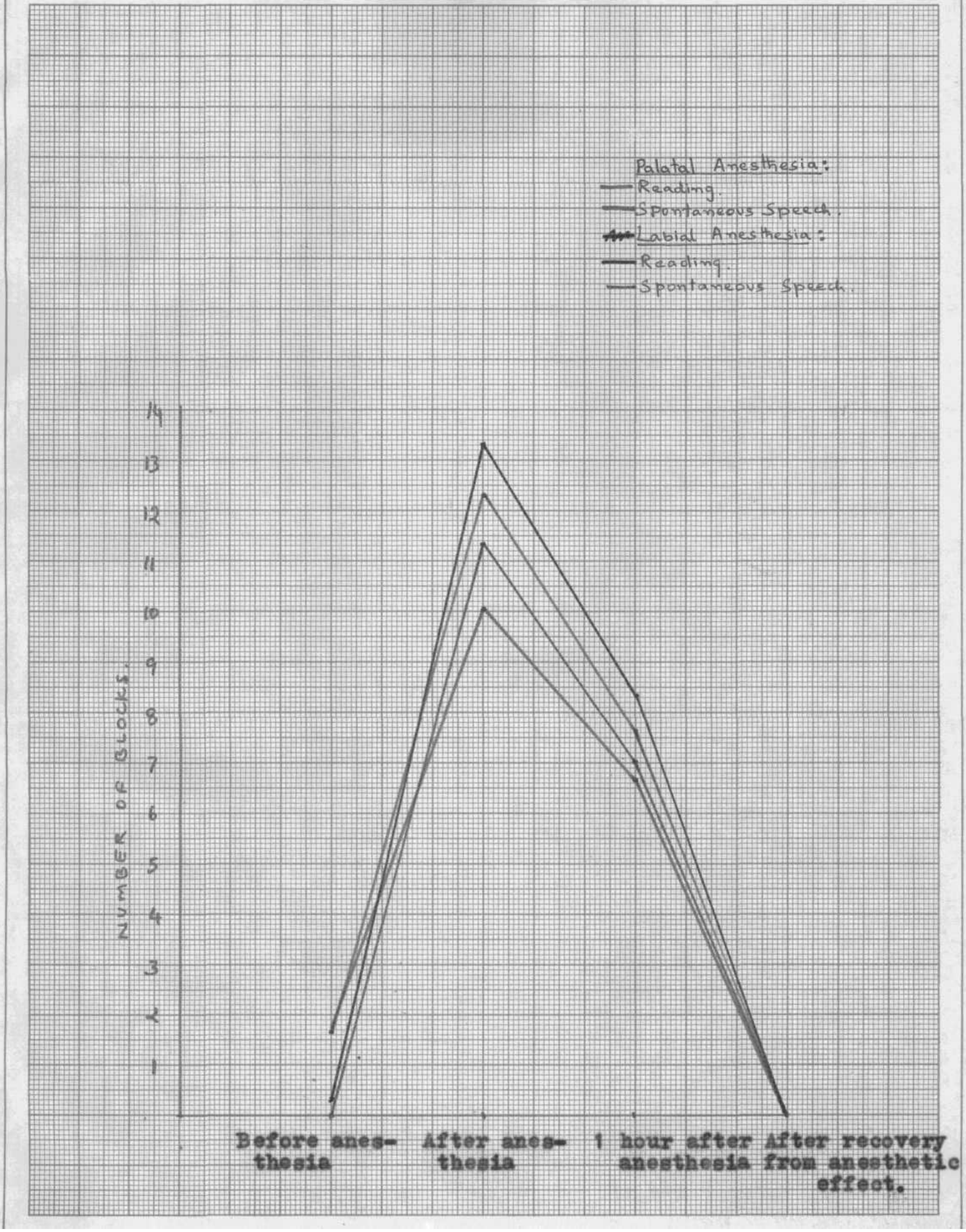
Showing the effect of palatal and labial anesthesia on syllable output in stutterer.



Comparison of the effect of palatal and labial anesthesia in stutterer.



Comparison of the effect of palatal and labial anesthesia in normal.



CHAPTER V

SUMMARY AND CONCLUSIONS

Problem of the study was to note the role of tactile and kinesthetic feedbacks from palate and lips in stuttering. One way of studying this is by disturbing the feedback. This was done by anesthetization of palate and lips separately.

For this purpose, a stutterer and a normal were taken as subjects. Reading and spontaneous speech of the subjects were studied under following conditions :

Section 1 - Before anesthetization.
Section 2 - Immediately after anesthetization.
Section 3 - One hour after anesthetization.
Section 4 - After complete recovery from anesthetic effect.

Theae conditions were same for both palatal and labial anesthetic experiments.

Each section had one reading session. Thus eight reading materials were required. To avoid adoptation effect, eight different reading materials comparable to each other in terms of syllable output/minute were choosen using five normal speakers. Normal variation in reading rate was also noted.

Each section had one spontaneous speech session. Possible normal variation in spontaneous speech in terms of syllable output/minute was also noted using same five normal speakers.

The reading and speaking were recorded on Cassette Tapes in each section. They were analysed by three judges for number blocks in each section. After checking intra and inter judge reliability, the scores noted by the judges were considered for further analysis.

The findings of this study are:

1. There is substantial reduction in stuttering of stutterer under palatal and labial anesthesia.

2. Labial anesthesia produced more reduction in stuttering than palatal anesthesia.

3. Syllable output of the stutterer increased under palatal and labial anesthesia.

4. Labial anesthesia produced more increase in syllable output than palatal anesthesia.

5. Palatal and labial anesthesia produced stuttering like behavior in normal subject.

6. Under labial anesthesia, normal subject, showed more blocks than under palatal anesthesia.

7. Normal subject showed decreased syllable output under both palatal and labial anesthesia.

In conclusion, the results of the present study thus suggest a possible role played by the tactile and kinesthetic feedback from palate and lips in stuttering and normal speech. In other words, the results suggest that tactile and kinesthetic feedbacks from palate and lips play a vital role in triggering and ongoing execution of speech.

The reduction in stuttering under anesthetic conditions in stutterer and presence of stuttering like behavior in normal under anesthetic conditions suggest that stuttering may be due to disturbance in tactile and kinesthetic feedback, atleast in the present subjects.

The consistent effect of labial anesthesia on stuttering (i.e., more reduction in stuttering under labial anesthesia than under palatal anesthesia) and on normal fluency (i.e., more stuttering like behavior in normal under labial anesthesia than under palatal anesthesia) suggest that tactile and kinesthetic feedbacks from lips may be more important than from palate.

Recommendations for further research.

1. Similar study may be conducted on more number of subjects,

2. Combined palatal and labial anesthesia on the same subjects may be tried.

3. A prosthetic plate covering complete palate may be tried on stutterers as a therapeutic device.

4. Similar techniques may be tried to cut-down the feedback from lips.

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APPENDIX I

SCORE SHEET

Name:

Age :

Education:

Sex :

Expt. No.	Section No.	Reading/Spontaneous speech

Instruction.

Please listen to tapes and note down the number of blocks that you identify. Whenever you identify a block, mark 1 and hence after five blocks, markings will be

APPENDIX 2

SCORE SHEET

Name:

Age:

Education:

Sex:

Expt.No	Section No.	Reading/Spontaneous speech
Prolongation		
Repetition		
Pauses		

Instruction.

Please listen to tapes and note down number of prolongations, repetitions and pauses that you identify in their respective spaces.

Whenever you find a block for example prolongation, mark 1 in its respective place. Likewise five stuttering blocks of prolongation type will be marked as in the space provided for prolongation.

APPENDIX 3

DEFINITIONS OF TERMS

1. Prolongation - When you consider any sound or syllable when it is prolonged more than normal duration, please mark it as prolongation block.

2. Repettition - When any sound or syllable word or part-word is repeated more than once, please mark it as repetition block.

3. Pauses - When you consider that there is a gap in the ongoing speech, which is more than normal, please mark it as a 'pause block'.