

General and Differential Therapy in the Field of Logopedics and Phoniatics

F. TROJAN* & H. WEIHS*

Speech and voice disturbances, however manifold they may be, concern man's natural disposition as a whole. This is anatomically and physiologically homogeneous but varies genotypically according to race and biological constitution or phenotypically due to environmental influences particularly those of speech and culture. Through the common factor a **general** therapy can be developed for all speech and voice defects, in which emphasis may be given to various parts according to the specific problem. On the other hand a **differentiated** therapy may be compiled on the basis of constitutional and environmental influences as well as pathological variations from the norm. Actually both treatments combine to form an inseparable whole.

The first part of this paper deals with the general, while the second outlines the differentiated logopedic and phoniatic therapy.

1. OUTLINE OF THE GENERAL LOGOPEDIC AND PHONIATIC THERAPY (TROJAN).

General therapy may be divided into two, each relating to physiological structures of different evolutionary age. One covers a group of **antagonists** i.e. a between-two-poles-moving-mechanism such as the vegetativum (vegetative nervous system), respiration and register mechanism (the regulation of the falsetto, chest voice and so-called *voix mixte*). These are all innervated first and foremost by the sub-cortex. The other is characterised by a basically different technique, using distinct **oppositions** of typically cortical nature, even if, (as assumed by Penfield and Roberts) the integration of such functions is on a sub-cortical level in

speech. This sphere includes the oppositions: phoneme, word symbol, grammar, syntax and logical stress.

Although these oppositions vary from speech community to speech community, all languages have certain invariable characteristics, which justifies their grouping in a general logopedic treatment.

A. The Antagonists

Here, only the following will be discussed: vegetativum, respiration, abduction and adduction of the vocal cords and the register mechanism. The first three antagonists are of importance in the treatment of stammering, cluttering and their combination, whereas the latter three are more prominent in the treatment of vocal disorders. The vegetative rhythm plays a limited part in the treatment of vocal disorders.

(i) Vegetativum

One must clearly differentiate between thalamencephalic innervation and the sympathetic and parasympathetic parts of the vegetative or autonomic nervous system. The former is characterised by a behaviour pattern of the organism as a whole which can be described both by its function and its symptoms. To this part the terms "trophotropic-endophylatic" and "ergotropic" functional tendencies belong. (W. R. Hess). The terms "sympathetic" and "parasympathetic" refer however to peripheral anatomic structures, whose functions are not easily differentiated. It suffices for us here to differentiate between the trophotropic and ergotropic functions.

Basically the trophotropic functions are to assimilate the food brought into the body and to use it either for growth or to form an energy reserve for emergencies. (W. B. Cannon). Furthermore the trophotropic functions include sex and reproduction and as a further development along the line of individual trophotropy we have the social emotions (developed from the food-source relationship with the mother) and under certain conditions productive art may develop on the whole trophotropic basis. On the other hand we have the ergotropic functions (through secretion into the blood of adrenalin and glycogen) which result in an in-

* Felix Trojan: Ph.D. 1919, Univ. Vienna, Dozent (Phonetics) 1947, Prof. 1955. Leader of the Speech and Voice Department, E.N.T. Clinic, Univ. Vienna. Vice President Intern. Association Logopedics and Phoniatics, Honor. Member Società Italiana di Fonetica ecc. and Sociedad Española de Hipnosis Clínica y Experimental. Corresp. Member New York Society for Speech and Voice Therapy, Inc. Member of the Permanent Council for International Congresses of Phonetic Sciences, Editor "Folia Phoniatica" and "Phonetica" &c.

* Herta Weihs, Ph.D. Leader of the Speech and Voice Department General Hospital St. Pölten, Lower Austria, and Ass. Speech and Voice Department E.N.T. Univ. Clinic, Vienna.

crease in muscular performance and thus act as a protection against environmental dangers. On a higher level we have the constant achievements of the will and under special conditions the technical regulation of nature. Of course both trophotropic and ergotropic functions which lie on the higher level involve more cortical activity.

Proof that both parts of the vegetativum also influence the voice in various ways was presented in "The Experimental Study of the Connections between Vocal Expression and the Vegetative Nervous System". (1952). "Soft" voice is linked with the trophotropic function and "potent" voice with the ergotropic. "Soft" voice is characterized by smooth onset, gliding volume change, quiet breathing, dominance of the vocal elements and legato; whereas the "potent" voice shows harsh onset, abrupt breathing, dominance of consonants and general staccato.

The natural transition of the vegetativum from peacefulness, contemplation and introspection on the one hand to the fight for life, on the other, is frequently threatened by the demands of society and our technical age. Every society demands certain norms of behaviour which inhibit instincts (particularly aggression (ergotropic) and sex (trophotropic)). Through the mechanisation of our age and our "tempomania" (love of speed) (W. Birkmayer) as well as the increased work demand the vegetative equilibrium frequently swings to the sympathetic pole.

Speech and voice therapists encounter disturbances of the vegetativum in the stammering field where, apart from medical and psychotherapy, direct speech therapy is required. For this purpose a "phonic training" aids the restoration of the natural vegetative equilibrium. Through the correct speaking of verse in which calmness has received artistic expression the trophotropic tendency can be activated. With regular practice of this and the vocalised expression of courage (ergotropic) the anticipatory fear of the speech situation may be reduced.

(ii) Respiration.

The respiratory mechanism, like the vegetative equilibrium to which it is closely linked, may be disturbed by the influence of society, as in the wearing of tight clothing which inhibits the work of the diaphragm. It is important therefore, that the therapist sees that all cases achieve correct breathing. The patient should also be taught the conscious control of the an-

tagonistic movements of inspiration and expiration. As far as the inspiration is concerned an "inspiratory tension" can be achieved which reduces the subglottic pressure on the larynx. This is of benefit not only for cases of vocal defect but also for stammering. The "inspiratory tension" is achieved by merely imagining that one is breathing in while actually breathing out (speaking). It has been shown by M. H. Draper, P. Ladefoged and D. Whitteridge in their electromyographic studies that, during the speaking of longer phrases the active expiratory muscles function either right from the onset of speech or after a short period during which the natural relaxation of the inspirators occurs. It can therefore be assumed that through the use of inspiratory tension, this process of active expiration becomes more intense and sets in earlier, as the air pressure required for phonation is absent. In the use of the "soft" voice and therefore of a minimal use of the active expirators, the above control of the respiratory antagonists has proved to be of great value to the therapist. The rib-reserve breathing method is based on a similar principle, the expiratory movements being divided.

(iii) The Vocal Cords.

The smooth onset typical of the "soft" voice requires a co-ordinated movement of the antagonistic adductors and abductors of the vocal cords (lateral and posterior cricoarytenoid muscles). The "messa di voce" which characterizes the "soft" voice, and even more, the singing voice depends on the fine co-ordination of the respiratory and laryngeal muscles. It is an important task of logopedics and phoniatics to cultivate this sensory-controlled mechanism. The importance of a smooth onset, particularly in the treatment of stammering, has been known for a long time.

(iv) The Register Mechanism.

The importance of the physiologically correct use of the various resonators through the employment of the extralaryngeal muscles, was not recognised for a long time. It is well known that the cricothyroid muscle plays an important part in the production of the falsetto voice (or the falsetto part of the voix mixte). W. & A. Zenker, however, showed that the cricopharyngeal part of the larynge-pharyngeal muscle may possibly contract if the sternothyroid muscle is tensed and this causes the vocal cords to relax (lowering the larynx) and the chest voice mechanism to function.

Therapeutically the antagonistic action of these muscles can be produced by firstly phonating a high pitched EE and then going on to a back or middle vowel in low pitch. A light tapping in the area of the sternum during this phonation, brings the vibrations of the thoracic cavity out more clearly and more intense contraction of the sternothyroid muscle is achieved. Suitable phrases can be used for this work.

B. The Oppositions

Speech, which is more or less a cortical activity, rises above the antagonists, without however becoming completely independent of them. The word symbols and their basis, the sounds and the mediums of grammar and syntax relate to each other in the manner of oppositions.

The following premises are necessary for a speech symbol to be formed. Firstly, a part must be picked out from the afferent whole. The relationship of the selected part and its background thus becomes as A to non-A i.e. in contradiction—everything which is not A is non-A. If such an isolated afferent is linked with an articulatory form (only possible with use of a sensory-motor arc) this link must be regarded as the basis of the word symbol.

Every word symbol is made up from a meaning and a specific form (articulation or writing). The meaning refers to the sensory, and the articulation to the motor side of the arc. When for similar things, similar symbols are used we speak of concept formation.

Just as the attachment of meaning to a speech symbol must remain constant, so the specific forms remain in fixed opposition. Accordingly, in the case of dyslalia the therapist must help the patient to learn to form and use sounds conforming to a strict norm. This task will not be equally difficult for all sounds. R. Jakobson has shown that there are earlier and later evolved sounds and that the later sounds are most likely to be difficult for speech-retarded children. It has also been shown (by the present author) that the earlier sounds are those produced during vocalized chewing. From such and similar arguments it may be concluded that articulation is a "secondary function" of vocalized chewing. (cf. E. Froeschels).

Of course, the speech sounds themselves, are the products of muscular antagonists. Proof of this is shown by a well tested treatment for sigmatism, in which a double antagonist is used.

First, the pointed tongue is protruded through the co-ordination of the genio-glossus and the transverse tongue muscle. The tongue then is drawn back into the mouth and made as wide as possible (achieved by the contraction of the hyoglossus and the stylo-glossus as well as the longitudinal tongue muscles). This sharp contrast of movement (antagonistic in nature) results in an extreme widening of the tongue. It should be associated with saying "ee" and feeling the tongue touch or almost protrude on both sides of the upper and lower premolar teeth. This position of the tongue leads to the formation of the proper groove needed for the production of a correct "s". If a perfect symmetry of both halves of the tongue is attained it is seen that the relationship of the tongue tip to the teeth does not inhibit the free passage of air and a correctly produced sound may be speedily achieved.

II. OUTLINE OF THE DIFFERENTIATED PHONiatric-LOGOPEDIC THERAPY (WEIHS).

Whereas the "general" therapy focuses—according to Trojan's explanation—on normal functions, the "differentiated" therapy aims at reorientating the disturbed functional conditions into natural channels within the individual's psychosomatic pattern. The aims of treatment vary according to the etiology and nature of speech and voice disorders. Therefore, a detailed case history and an exact clinical examination is necessary to obtain (1) a **differential diagnosis** between primary organic and functional disorders of speech and voice; (2) an **adequate phoniatric-logopedic diagnosis**, based upon the study of the particular pathologic symptoms and their etiology and the participation of the total personality in the disease process. The psychologic approach in the diagnosis and the treatment is important in view of, (1) the multicausality of functional speech and voice disorders; and (2) the complexity of methods in which the afflicted personality is to be influenced therapeutically as well as (3) the close interdependence of speech, voice and personality.

A. ASPECTS OF THE DIFFERENTIATED PHONiatric-LOGOPEDIC DIAGNOSIS.

According to our clinical and experimental experiences the following aspects are to be taken into consideration for the purpose of a more detailed diagnosis:

1. Age.
 - a. maturity
 - b. differentiated disposition for disease (cf. Gerfeldt). Summarizing the possibilities

which cannot be exactly differentiated into age groups, we have:

In Infancy and Childhood

brain injury; encephalopathia; toxic infections (occurring before, during and after birth and leading either to chewing difficulties; different degrees of receptive and impressive dysphasias; deafness; mental, motor and sensory disturbances; ataxia; and abnormal behaviour patterns); attacks of ear, nose and throat infections; disturbances of nutrition and of skeletal development; postural defects; psychogenic disturbances; schizoid psychopathia. The disposition for glottal and respiratory spasms is given with familiar neuropathic constitution, hypocalcemia, spasmophilia at birth, and with abnormal psychic reaction tendencies, (e.g. stubbornness and aggression). Voice disorders, chronic hoarseness, mild laryngitis and nodes may arise out of frequent crying in infancy; prolonged and violent coughing spells; allergy e.g. a tendency towards infiltration of the tissue (Cf. Sedláčková); constant shouting; vocal strain experienced in school. (cf. Greene.) This also continues during the period of rapid growth, such as

In Adolescence

we find disposition for upper respiratory tract infections; toxic infection (focal infection such as diseases of the teeth and chronic tonsillitis may also influence voice disorders in adulthood); constitutionally determined faults of posture and breathing; allergy and bronchial asthma, vegetative and vasomotor lability; functional psychic and motor disturbances. Prolonged puberphonia beyond the normal age may be due to hormonal deficiency or organic disorders e.g. multiple papillomata in the larynx, asymmetry of the upper thyroid notch (cf. Weiss) or to psychological disturbances, neurosis (arising from faulty education or pronounced feminine personality component in the male).

In Early Adulthood

diseases of the respiratory organs, the teeth and the throat and neck region (cf. Stolze); the latter appears to be conditioned by a disposition toward neurotic manifestations in this age group; in women: metabolism diseases; in men the healing process is generally delayed (cf. Gerfeldt.)

In Middle Age

we have in addition a disposition towards diseases of the circulatory and digestive systems; the onset of immobility in the thorax; in diseases of the throat and neck region (associated with

e.g. globus, disturbed mobility of the vocal cords and vasomotor lability). Pathogenetic factors are: arthritic deformities of the cervical and upper thoracic vertebrae as well as the increased disposition for psychoneurotic and mental disturbances, which in women are conditioned by hormonal metamorphosis; in men there is a disposition towards carcinoma of the larynx and cerebral insults.

In Old Age

involution processes of the larynx and the total organism; increasing immobility of the thorax; disposition for carcinoma of the larynx and cerebral insult; personality regression.

II. Physique:

1. the special anatomic characteristics of the physique,
2. the condition and adaptability of the vegetative and endocrine system
3. the disposition of various diseases
4. the momentary vegetative reaction tendency
5. reaction to stress
6. fatiguability.

III. Temperament:

1. personality (according to Trojan: on the basis of the trophotropic, ergotropic and the cortical functions as well as from the corresponding forms of vocal expression of affects).
2. pathologic personality patterns (e.g. hysteria, psychosis, schizoid psychopathy, depressive or obsessional states).

IV. Individual History:

1. physical development
2. heredity: (e.g. familia neuropathy, schizophrenia, epilepsy, psychopathy, imbecility, familia central speech imbalance (cf. Weihs). constitutional delayed speaking, motor and language.
3. environment: the emotional familiar atmosphere is responsible for the pathologic functioning of the child's voice and speech; disturbances may become fixed in childhood and persist as early established behaviour patterns in the adult; we consider also the actual vocational and familiar situation and the ability to relate.

V. Special Etiological Factors:

1. psychic disturbances

2. endocrinological disorders
3. allergy (tendency to infiltration of the tissue) and asthma
4. postural defects (e.g. hyperlordosis of the lumbar and cervical spine),
5. organic defects of the vertebrae,
6. deficiencies of the breathing mechanism leading to respiratory insufficiencies: e.g.
 - a) thoracic underdevelopment
 - b) thoracic immobility
 - c) thoracic deformity
 - d) underdevelopment or lack of training of the respiratory muscles
 - e) paradox diaphragmatic movements

VI. Further Local Organic Defects:

1. structural abnormalities: e.g.
 - a) congenital deformity of the larynx, epiglottis.
 - b) anomalies of the upper respiratory tract (cleft palate, short soft palate, asymmetry of the atlas vertebrae)
 - c) obstruction of the nasal airway
 - d) articulatory abnormalities.
2. congenital deafness, partial or complete,
3. multiple papillomata of the larynx,
4. external trauma of the larynx,
5. partial palsy following thyroidectomy.

B. THE EXPERIMENTAL DIAGNOSTIC METHOD

For diagnostic purposes, the clinical examination—internal, neurologic, X-ray, laboratory, audiometric and phoniatic-logopedic—is supplemented by experimental investigations (cf. Weihs). The following techniques appear useful for objective diagnosis as well as for assessing the influences upon speech, voice and breathing exerted by phoniatic-logopedic treatment.

1. **Electroacoustic analysis**, to assess sound quality, volume, resonance and carrying power of the
 1. speaking and singing voice before and after treatment
 2. oesophageal speech
 3. speech and voice of the deaf (hard of hearing) adults after training with hearing aid
 4. postoperative cleft palate speech (after speech therapy)

The technique is supported by intelligibility tests (providing an objective measure) e.g. telephone nonsense-syllable test with laryngectomized patients (cf. Weihs).

II. Radiographic techniques.

1. Lateral cine X-ray examinations of the larynx
2. frontal tomograms and posterior-anterior "Hartstrahl" X-rays.
3. X-ray examination of
 - a) the whole spine
 - b) the wrist
 - c) the diaphragmatic movements.

III. **Electromyographic examinations** (to be carried out in voice disorders, cluttering and neuropathic and psychopathic stuttering) (cf. Bente et al . . . Trojan-Weihs).

IV. **Electromyographic technique** with synchronous sound (which is to be compared with the vowel spectrum) to assess the activity of the muscles of the neck, sternocleido-mastoid (before and after treatment; to be carried out also with laryngectomized patients; with superficial electrodes).

V. Spirographic investigations

1. spirometric measuring of the lung capacity, the pulmonary volumes and the pulmonary ventilation (to be carried out also in laryngectomized patients).
2. spirographic registrations during phonation and speech, to assess the use of breath and oxygen for phonation (to be carried out with stutterers and clutterers also).

VI. **Electrovibration-Test:** to observe the changes of muscle tone as a reflex response to mechanic stimulation.

VII. **Automatic Reactometer Test**, (developed by Hauswirth and Kraemer), to determine the functional predisposition of the autonomic nervous system (following Imrc).

VIII. Psychological assessment.

1. Projective Tests: TAT, CAT (Murray); drawing tests: Tree-Test (Koch), drawing the human figure (Mancover), drawing the family (Minkowsky and Parot), etc. Bibliographies and stories compiled by the patient which enable the personality to be assessed in depth through the overall organisation of the expressive activity in combination with
2. the Emotional Resonance Test (G.R.T.) (Trojan) and the Personality-diagnosis from the speaking voice (Trojan-Teirich) to disclose the structure of the personality

in terms of the two vegetative dispositions and the range of the cortex (as described previously) and from the corresponding forms of vocal expression of affects.

Apart from personality tests, stress is laid upon **conversations** in a relaxed atmosphere, from person to person. Such a personal contact enables the phoniatician to observe the pattern of the actual overall speech of the patient, his general attitude, his behaviour pattern, his reaction to his disability as well as the condition of general muscular and nervous tension as seen in posture, gesture, body movement and the ability to relate towards people.

A special **battery of tests** is used to investigate the level of intelligence, motor, speech and language development; comprehension of speech, auditory and visual memory; visuo-motor and constructive activity; the type of ideation (the individual prevailing tendency toward motor-kinesthetic, visual or acoustic imagery); speech classification. The items are taken from the Oseretzky-Göllnitz scale, Merrill-Palmer and Terman-Merrill Scale, Wechsler Bellevue (cf. reference in Arnold, Luchsinger). We test also the musical gifts, the feeling and sense of rhythm and sound.

C. THERAPY

It is here only possible to give a general outline of differentiated therapy in accordance with the various problems mentioned above.

1. The severe central defects such as receptive and impressive dysphasias, central dyslalia (Seeman) and dysarthria, combined with classical neurological disorders; the delayed speech development with the syndrome of extrapyramidal voice and speech disorders, speech disorders in general motor retardation and in grave psychic asthenia, aphasia in adults and acoustic agnosia (cf. Seeman) require a neurologic treatment and in many cases a phoniatic-logopedic therapy which may help to improve the disturbed functional conditions. The same is true of the stammering with the "sensory" or "motor" component of cluttering (abnormal EEG) (cf. Trojan-Weihs and the references listed there).¹

2. The simpler cases of receptive and expressive dysphasias in cases of delayed speech and language; "functional" dyslalia—arising from motor or sensory disorders, ataxia and low intelligence; "organic" dyslalia due to peripheral-receptive defects (such as audiogenic dyslalias and dysglossias etc.) (cf. Arnold, Luchsinger).

The logopedic treatment helps the patient not only in the areas in which he has the greatest difficulties, but contributes to the further central speech development, peripheral-expressive speaking ability and cerebral integration. Therefore, therapy has to begin as early as the age of 4 or 5, or earlier in cases of deafness.

3. Functional speech and voice disorders, psychoneurotic speech disorders, the neuro- and psychopathic stuttering as well as the manifold forms of "functional" voice disorders and of nasal dysphonias necessitate a phoniatic-logopedic therapy, which is in accordance with the total personality pattern, focussing on rehabilitation of the defects and on psychotherapy.

THERAPEUTIC MEASURES

One of the first aims of differential therapy is to correct the postural and breathing faults with the help of a "passive" and "active breathing therapy". By "passive breathing therapy" is meant the technique which allows the patient to utilize his respiratory mechanism to the full. Electro-vibration which is carried out over the lumbar-sacral-pelvic region, along the spine, on the neck and the mastoids, is expected to lead to a vagus controlled condition. (cf. Bischoff, Mozer, Schmitt). "Active breathing therapy" helps the patient to get the feeling of and learn rhythmic breathing and the conscious control of fine co-ordinated breathing and phonation (respectively the uninhibited flowing out of breath, controlled by support of the respiratory apparatus which gives the voice emission the utmost expanding ability) as well as the natural posture and movement which are needed for speech. In cases of paradox diaphragmatic movements and organic defects of the vertebrae an additional breathing-orthopedic treatment is necessitated (cf. Schmitt).

In **voice disorders** we achieve full breathing and full amplification of the tone as well as an optimal base of articulation by elongating the whole spine, especially by diminishing the lumbar and cervical lordosis and poising the head in relation to the spine (which is helped by exercises with a neck-extension-cushion) and by relaxing the mandible and moving the tongue towards the hard palate. In electromyographic registrations there is an harmonious interaction of the muscles of the neck which keep the head correctly balanced on the shoulders during respiration, (the sterno-cleido-mastoid muscles and the respiratory muscles as well as the infra- and suprahyoid muscle groups). This harmonic in-

teraction (preparatory to the onset of voice) helps the diaphragm and the larynx to descend on inspiration and the musculature of the tongue to relax, thus facilitating the balance of register-functions and the process of articulation. Lateral X-Ray pictures show the whole supraglottic portion of the larynx and the pharynx enlarged. The changes in the reciprocal position of the hyoid bone and the bony larynx together with the epiglottic-laryngeal fat-body-mechanism (Zenker) interfere in improving the abduction, the vibration form and the adduction of the vocal cords. **Primarily hypokinetic voice disorders** due to vegetative and muscular hypotension, the different degrees of **internal tensor weakness** and the **paresis of the recurrent nerve** require a combination of the above described electro-vibration and the harmonious vibration of the larynx and the sternum during phonation on the same pitch, with an electrophysical treatment in the form of a selective muscle stimulation by exponential current—(cf. Trojan-Weihs).

In **hyperkinetic voice disorders** however, which arise from ergotropic tension, psychogenic disturbances, spasmic tendencies, vocal abuse etc., in **dysphonia plicae ventricularis** and **rheumatic laryngeal arthritis** it appears useful to combine the electro vibration with the special harmonious vibration of the larynx and sternum.

The phoniatic treatment of hyper-or hypokinetic voice disorders begins only when all inflammations and infections are removed. In the case of organic defects of the vertebrae and of paradox diaphragmatic movements a special breathing-orthopedic treatment is necessary.

CONCLUSION (TROJAN):

The polarity between general and differentiated therapy presented in this paper can be used by every logopedic and phoniatic therapist to determine which trend his therapy follows. The more generally orientated therapist aims at normality and thinks teleologically. He will sometimes expect better results from his treatment than is possible but he will not be discouraged by the facts of heredity and pathological environmental influences, whose importance he may underestimate. Conversely, the differential therapist will tend to concentrate on the causal connections between the pathological symptoms, heredity and environmental influences. He may show less optimism with regard to therapeutic prognosis and it may be difficult for him to rise above the viewpoint of determinism. The true aim of the logopedic and phoniatic therapist should be to find his own medium between the two lines of treatment we have shown.

BIBLIOGRAPHY

ad I (Trojan)

M. H. Draper, P. Ladefoged and D. Whitteridge:

Respiratory Muscles in Speech, J. of Speech & Hearing Research. 2. pp.16-27 (1959.)

E. Froeschels:

Medizinische Beiträge zu einer Theorie der Entstehung der Sprachbewegungen (der artikulierten Sprache). Arch. Néerl. Phonétique Experimentale 15-81. (1939.)

W. R. Hess:

Die funktionelle Organisation des Vegetativen Nerven-systems, Basel 1948.

R. Jacobson:

Kindersprache, Aphasie und Allgemeine Lautgesetz. Uppsala Univ. Aarsskrifter, 1942, 9, p. 1.

F. Trojan.

Der Ausdruck der Sprechstimme. 2nd ed. Vienna 1948. Zeichen, Silbe und Laut in Entwicklungsgeschichtlicher Sicht, Phonetica 1, 63-81. (1957).

F. Trojan et al:

Experimentelle Untersuchungen über den Zusammenhang zwischen dem stimmlichen Ausdruck und dem vegetativen Nervensystem. Folia Phoniatica, 4, 65-92. 1952.

W. Zenker und A. Zenker:

Über die Regelung der Stimmlippen-spannung durch von außen angreifende Mechanismen. Folia Phoniatica, 12, 1-36, (1960.)

Ad II (Weihs).

Arnold, G. und Luchsinger, R.

Lehrbuch der Stimm-und Sprachheilkunde, 2. Aufl. (Springer, Wien 1959).

Bente, D; Schönhärl, E. und Krump, J.

EEG Begunde bei Stottern und ihre Bedeutung für die medikamentöse Therapie. Arch. Ohr.-Nas.-Kehlk-Heilk. u.s.w. 169: 513-519. (1960).

Bischoff, K.

Die Winklerkur, Zeitspiegel des Atems (Kuppe), p. 92-96 (Schwabe, Bad Homburg 1960).

Buch, J. N.

The HTP technique. J. clin. psychol. (1948), (1949).

Gerfeldt, E.

Differenzierte Krankheitsanfälligkeit und Lebensalter. Vita humana 1: 19-42, (1958).

Göllnitz, G.

Die Bedeutung der frühkindlichen Hirnschädigung für die Kinderpsychiatrie (Thieme, Leipzig 1954).

Greene, M.

Diagnosis and treatment of late speech and language development in children. Folia phoniatic. 12: 101-107. (1960).

Inure, V.

Sprachstörung und vegetative Konstitution. Folia phoniatic. 12: 273-281. (1960.)

- Kocj, K.** Der Baumtest. (Huber, Bern. 1954).
- Minkovska, F. und Porot, M.** L'enfant et le dessin. Pédiatrie (1952).
- Mozer H.** Brennpunkte der Krankheiten, 2. Aufl. (Haug, Ulm. 1954).
- Murray, H. A.** Exploration on personality. (Oxford Univ. Press. New York 1938).
- Oseretzky, H. J.** Psychomotrik. Beih. z. Z. angew. Psychol. (1931).
- Schmitt, J. L.** Atemheilkunst, 3. Aufl. (Müller/Humata, München/Berlin und Bern/Salzburg 1957).
- Sedlácková, E.** Les dysphonies hyperkinétiques des enfants, causées par surmenage vocal. Folia Phoniatic. 12: 48-60. (1960).
- Seeman, M.** Sprachstörungen bei Kindern (Marhold, Halle/ Saale 1956).
- Stolze, H.** Das Obere Kreuz (Lehmann, München 1953).
- Tierich und** Die Stimme des Arztes in der Ordination.
- Trojan F.** Aktuelle Probleme der Phoniatrie u. Logopedie. 2, Karger. Basel. 1961.
- Trojan F. und Weihls H.** Zur Behandlung einseitiger Recurrenspareses. Arch. Ohren-uns. Heik.u. Z.Hals-usw.Heik. 169 233-235. (1956); Studien zur Stotterbehandlung. Folia phoniatic. 14: (1962).
- Weihls H.** Die Beeinflussung der vegetativen Tonuslage durch komplexe akustische Reize. Folia phoniatic. 6: 19-34. (1954) Stimmstörungen und Persönlichkeitsstruktur. Folia phoniatic. 9: 101-155. (1957); Der Einfluß benachbarter Bewegungssysteme auf die Hervorbringung der Oesophagussprache. Arch. Ohren-uns. Heik. u. Z.Hals-usw. Heik. 173: 529-533. (1958); Beiträge zur Kenntnis und Behandlung von Stimmstörungen. Folia phoniatic. 13: 13-55 (1961); Funktionsstörungen der Stimme und Psychische Hygiene. Akt. Probl. Phoniatic. Logop. 2:140-166. (Karger, Basel/New York 1961); Fatigue and psychic caturation in sing and speaking. K. modern education. (Boktor, Cairo 1954).
- Weiss, D. A.** The pubertal change of human voice. Folia phoniatic. 2: 126-159 (1950); Cluttering (central speech imbalance). Folia phoniatic. 3: 111-132 (1951).
- Zenker, W.** Anatomische Probleme zum Spannmeehanismus der Stimmlippen. Wien.klin.Wxchr. 70 801-802. (1958); Über Bindegewebsstrukturen des Kehlkopfes und seines Aufhängesystems und deren funktionelle Bedeutung für den Kehlkopfraum. Mschr. Ohrenheilk. 92: 269-307: 349-383. (1958).