The Netherlands

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Abstract
A survey is given of the organisational and educational development of logopedics and phoniatrics in the Netherlands, followed by a view on the scientific progress in the last decades.
In 1905 the first Chair of Otolaryngology occupied by H. Burger meant a stimulus to scientific and professional work in the field of speech and voice. In 1927 the Dutch Association for Logopedics and Phoniatrics was founded and in 1974 a group of Dutch ENT-specialists assembled in a working group for Phoniatrics, later expanding into a Society for voice, speech and language pathology. Since 1992 a quarterly Journal has been published.
The phoniatrical development in the area of physiology and pathology of speech, articulatory and acoustical phonetics started with Donders (1857), Zwaardemaker (1904), Burger and Kaiser (1925) by means of mechanical registration.
After World War II phoniatrical interests shifted towards the study of speech and voice pathology in a broader sense, with the aid of electronical, radiological and other imaging techniques, in multidisciplinary approach. In the survey is reported on the Dutch contributions in speech tests, speech diagnosis, specific language impairment, aphasia, cluttering and stuttering. Data are given about the incidence of these disorders in the Netherlands.
In the reports about voice the basic research by van den Berg (1958) and Schutte (1980) on aerodynamic factors is mentioned, as well as the work on phonetography Waar/Damsté (1968), electroglottography Lecluse (1977) and on electromyography Dejonckere (1987).
Clinical reports on voice disorders were issued at the forum of two Dutch ENT congresses (1976 and 1994).
Special attention is drawn to speech and voice after laryngectomy and the Dutch contributions to research on esophageal speech and on tracheo-esophageal voice by Groningen and other "buttons".
Cleft palate speech and nasality have been studied since 1956 in Amsterdam (van Gelder), Utrecht (Honig, Damsté) and Groningen (Huffstadt). Evaluation of the speech after cochlear implantation (Utrecht and Nijmegen (1991 – 1997) has provided important data on intelligibility and voice qualities.

Organisational and educational development.
In 1905 the first Chair of Otolaryngology was occupied by Professor Hendrik Burger (1864-1957) at the University of Amsterdam. In 1907 the Universities of Leyden, Utrecht and Groningen followed.
This was a stimulus to scientific and professional work in the field of speech and voice. In 1911 the Dutch Society of Speech Teachers was formed, followed in 1918 by the Society for Speech and Singing.
A third organisation, the Dutch Association for Logopedics and Phoniatrics was founded in 1927, three years after the foundation of the International Association of Logopedics and Phoniatrics. In 1953 a fusion took place between these organisations. Since 1927 a monthly Journal was published —"Logopaedie en Phoniatrie"—.
In 1974 a group of Dutch ENT specialists , interested in the field of speech and voice, assembled in the "Working group for Phoniatrics", for scientific and professional interests. A few years later this medical ENT group transformed into

a Society, which also admitted non-medical members (linguists, psychologists): the Dutch Society for voice-, speech – and language pathology. This Society is linked to IALP and UEP. Since 1992 a quarterly Journal has been published named "Stem-, Spraak- en Taalpathologie" with scientific contributions from Dutch and Belgian authors.

Scientific development
F.C. Donders (1818-1889) was the first to describe the mechanism of Dutch vowels. Earlier than Helmholtz and Hermann he discovered the formants ("dominant tones") in vowels (1857).
H. Zwaardemaker (1857-1930) succeeding Donders to the Chair of Physiology at Utrecht, studied the articulation of vowels and consonants. Together with Quix he proposed a system of Dutch speech sounds, to be used in the diagnosis of hearing losses. With Eykman he wrote a textbook on Dutch phonetics and studied the pitch of the resonatorsystem, as well as aspects of nasality.
Hendrik Burger, who in 1891 wrote a thesis on "Laryngeal disturbances in tabes dorsalis" was the author of the first Dutch ENT textbook in 1918. In 1925 he published together with Louise Kaiser the first Dutch study on "Speech without a larynx".
Branco van Dantzig (1870-1942), one of the founders of the Dutch Association for Logo-pedics and Phoniatrics delivered 140 publications on logopedic problems (a.o. sigmatismus).
Louise Kaiser (1891-1973) published 170 articles a.o. on phonetical subjects and on the physiology of speech. She was Lecturer of Experimental Phonetics at the University of Amsterdam (from 1926-1958) and made extensive studies on the speech of certain sociological groups (children, students, regional dialects). Furthermore she studied the role of saliva in articulatory speech processes and the shape and dimensions of the hard palate. She described the "Kaiser effect": irregular changes of pitch during a vowel.
After World War II the attention shifted from phonetics and physiology towards speech and voice pathology and therapy. Speech ambulatoria became phoniatrical departments in close connection with ENT clinics of academical or other hospitals.
Diagnosis and treatment were the result of multidisciplinary teams of ENT specialists, audiologists, speech therapists, psychologists and social workers. Aphasia teams arose with neurologists, linguists and speech therapists. Cleft palate teams worked in close cooperation between orthodontic specialists, maxillo-orthopedic and plastic surgeons, ENT specialists and pediatricians.
In 1968 Helbert Damsté was appointed Lecturer of Phoniatrics at the University of Utrecht. Phoniatrical departments were also active in Amsterdam (Waterman, van Gelder, Devriese), Groningen (Moolenaar-Bijl, Schutte, Goorhuis-Brouwer) and Nijmegen (Wilms, Janssen, Peters). Contacts were made with opera houses and theatres for care of the professional voice and participation in the training of students at musical and pedagogical academies.

I. Speech.
In the study of articulatory speech defects Peddemors-Boon and van der Meulen (1977) developed the Utrecht Articulation Test. With pictures and sentences the phonemes are examined. Since the UTANT test (Utrecht Taalniveau Test) of 1977 several screening-techniques for children with speech retardation have been developed:
in 1982 the TVK (Taaltest voor Kinderen) by van Bon (Nijmegen)
in 1988 GRAMAT (Grammaticale analyse van taal) by Bol and Kuiken

in 1989 and 1994 the TSI for 3 – 6 years of age by Gerritsen
in 1995 the Reynell test for language perception (van Eldik) and the Schlichting test for language production.

Among the large group of children with speech retardation attention is drawn by Goorhuis-Brouwer and de Jong (Groningen, 1996) to the group of children with SLI (specific language impairment). Pure SLI occurs in 1 percent of children (boys 3 times more frequent). Nearly one half of these SLI children will cure spontaneously before 6th year of age. Their semantic-pragmatic language problems may resemble those in autistic children. De Jong expects that the newer neuro-imaging techniques (PET, MRI,ERP) will discover more basic cerebral processes in language-retarded children.

II. Language.
Levelt (1989) distinguished a conceptional system, a language system and a speech system, both in speech perception as well as in speech production. His model, consisting of three components: conceptualizer, formulator and articulator served as a theoretical basis for procedures of language analysis.

In recent years Maassen, van Lieshout, Hagoort and Indefrey (Nijmegen) apply psycholinguistic process analysis in the diagnosis of speech and language disorders. These authors point out a contrast in grammatical and phonological encoding, in which a semantical word affinity delays perception while phonological affinity accelerates perception.

III. Aphasia.
In the acquired speech disturbances especially the number of patients with aphasia is increasing.
The actual incidence of CVA is 25000 cases yearly, with 55 – 71% aphasia. Since 1970 revalidation is provided by SAN (Stichting Afasie Nederland).

The neurologists Verjaal (1950) and Grewel (1951) gave impulses by their studies of aphasia. Verjaal developed a diagnostic system, opposed to the "classic"global diagnostic system. He distinguished expressive aphasia from receptive aphasia, which latter form may be acoustic or optic. Grewel holds that in studying aphasia linguistic principles should be taken into account (lexical disorders). Hagoort (1990) in his thesis described the language understanding in aphasia and found that Broca aphasics are relatively delayed in the process of lexical integration. Wernicke aphasics often completely fail in integrating lexical meanings into sentence contexts.

Preceded by Moffie (1953), recently Prins (1987) and Bastiaanse (1997) described the periodical history of aphasia research. After the cognitive period (1906 – 1956) they dis-tinguished a period of experimental aphasiology (1960 – 1970), a linguistical period (1970 – 1980), a period of neuropsychological case studies and group studies (1980 's) and the period of language and right cerebral hemisphere (last decade).

IV.Cluttering and stuttering.
Moolenaar-Bijl (Groningen) wrote an article on cluttering in Froeschels' Twentieth Century Speech and Voice Correction (1948). She holds that acoustic and motor inattentiveness, feeble verbal memory and rapid speech tempo are manifestations of an organically feeble speech constitution in cluttering.

As early as 1905 the Dutch Society for ENT reported about the incidence of stutterers in Dutch primary schools: 1% of all pupils, of which 70% boys and 30% girls were stutterers.

In 1948 Goeman wrote an important monography on stuttering. As a logopedist he proposed a psychologically strengthening disciplinary approach.

In 1960 Grewel differentiated 18 forms of stuttering with different etiological factors (developmental, linguistic, neurotic, neurological). He stated that any attempt at a successful therapy should be aware of the many psychic, somatic, and psycho-social factors, which underlie the stuttering symptoms; therefore a differentiating therapy should be medicamen-tous, psychotherapeutic, logopedic, pedagogic, language-educative or socio-therapeutic.

In 1972 Damsté wrote a study on stuttering as a form of voluntary and involuntary behaviour. Re-education of the stutterer is focused on two levels:
on the autonomous emotional behaviour
speech automatisms of the sensomotor system have to be superimposed by distractive speech techniques.
Individual and group therapy (Schoenaker method) are advocated.

At Nijmegen University the psychologist H.F.M. Peters introduced studies on speech motor dynamics since 1985. Coordination and timing of respiratory, laryngeal, articulatory and perceptual functions in fluent and disfluent speech of stutterers were registered.

Peggy Janssen (Utrecht) working from 1968 – 1999 as a psychologist at the Phoniatric Department of Utrecht considers stuttering a multifactorial disturbance, in which heredity, personality and psychosocial factors play a role, next to cybernetical elements (feed-back). She wrote a monography on behavioural therapy in stuttering (1985) and comprehensive articles on the etiology of stuttering, with theories and models (1994, 1999).

V.Voice.
Important work has been done by the physicist van den Berg Groningen (1953) on the physical aspects of voice production as well as on the physiological basis of speech and singing. He distinguished internal coupling (between both vocal cords) and external coupling of larynx and resonators. In laryngeal pathology, with increased damping of the vibrations, the higher partial tones (originating from the supraglottal areas) may dominate.

The classic myoelastic-aerodynamic theory about passive vibrations of the vocal cords was strongly defended by van den Berg (1958) against Husson's "neurochronaxic"theory (1950), which held active contractions of the vocalis muscle responsible for the vibrations of the vocal folds, at the rate of the nervous impulses via recurrent laryngeal nerves.

In 1980 H.K. Schutte investigated the efficiency and other aerodynamic aspects of voice production in the normal and abnormal larynx by measuring sound intensity, air flow rate and subglottic pressure at various pitches.

Like Waar and Damsté in 1968, the phonetography was used by Schutte in 1975 in defining pitch and intensity in the frequency-span, not only in pathological

cases, but also in testing the professional voices of singers and teachers. About registers of the singing voice van den Berg, Schutte (Groningen) and van Deinse (the Hague) have published.

Electroglottography is used since 1970 at various Dutch phoniatrical centres; Lecluse (1977) identified the specific "events" in the electroglottogram: the moment of maximal closure was identified as the peak just after the steep slope, and the period of opening as the part just after the steep slope.He registered laryngeal tumours and functional disorders by means of electroglottography.
In 1983 Kersing investigated the muscles of the vocal cords in a histological and histochemical study. He found that in old age the endomysial connective tissue increases and that "targetoids" appear: areas of muscle with a low mitochondrial enzyme activity.

Dejonckere, succeeding Damsté at the phoniatrical chair of Utrecht in 1987, described electromyography of the larynx. He also contributed to the perceptual evaluation of the normal and pathological voice quality (1995) and added the "instability-factor" to the GRBAS-scale (Hirano 1981) for vocal tremor, spasm and voicebreak.

A comprehensive ENT-report on "chronic laryngitis" was written by Baarsma and Waar (1976), a second ENT-report on "aspects of voice disorders" was published by a number of Dutch phoniatricians in 1994. In the latter report Waar and Gerritsma (Rotterdam) discussed on occupational voice disorders, vocal load and vocal capacity whereas Van Wijngaarden gave an extensive review on laryngostroboscopy of organic and functional disorders.

In 1998 R. Buekers developed a quantitative phonometric study about voice performances in relation to demands (load) and capacity. In comparing a group of 20 female teachers with voice complaints and 30 without complaints it is shown that female teachers with a speech volume range smaller than 30 dB and a pitch range smaller than 2 octaves are not suitable for teaching. EGG and phonetography were used.

On spasmodic dysphonia Damsté (1989) and Devriese (1994) have published: the first on psychogenic factors and recurrent nerve resection, the latter on Botox-injections into the vocal cord.

On voice problems of hormonal origin Damsté (1964) and van Gelder (1971) have published several articles. Gender dysphonia and the voice of transsexuals have been studied at Rotterdam and Amsterdam (Waar, Mahieu).

On voice characteristics following radiotherapy in small glottic tumours van Wijngaarden published in 1988 and I.M. Verdonck-de Leeuw in 1998. The voice improved in more than half of the cases, but a deterioration of voice characteristics was assessed for 45% of patients, 6 months to 7 years after radiotherapy. Stripping the vocal fold for initial diagnosis and smoking after treatment have a negative effect on voice.

VI. Speech and voice after laryngectomy.
The voice after total laryngectomy was already studied in 1925, when Burger and Kaiser described a patient with an excellent alaryngeal voice. Considering the good quality of their patient's voice, it might be supposed that in this case a

postoperative fistula had developed between the trachea and the pharyngo-esophageal area, facilitating a tracheo-esophageal voice after laryngectomy.

Mrs Moolenaar-Bijl (Groningen, 1953) discovered that in alaryngeal speakers sentences containing many plosive consonants (p,t,k) were spoken more easily than sentences with few plosives ("Dutch"consonantal injection method of breath intake in oesophageal speech).

In 1958 Damsté published a thesis on "Oesophageal speech after laryngectomy" in which he concluded that almost all good alaryngeal speakers take in the air by injection, refilling the oesophagus every 2 or 3 syllables. This mechanism he called "the glosso-pharyngeal press".
Following the Blom Singer technique of tracheo-esophageal (TE) prosthetic voice three methods were introduced for these prostheses in Holland:
the Groningen button voice prosthesis (1982) and the newer low-resistance Groningen button (1992)
the Amsterdam Provox prosthesis (1990)
the Nijmegen prosthesis (1992)
In recent research (1999) the site and vibrations of the neoglottis in the pharyngo-esophageal segment were visualised by high-speed digital imaging.This method appeared to be a useful tool in studying the irregular vibrations of the neoglottis, which shows a wide variability in anatomy and morphology (van As, Hilgers, Tigges e.a. Amsterdam – Erlangen).

VII. Speech after cochlear implantation
Cochlear implantation (C.I.) has been performed at the University Hospitals of Utrecht and Nijmegen since 1991. Up till December 1999, 200 adults and 130 children (from 1.10 years on!) have been operated.

M.C. Langereis e.a. (Utrecht, 1997) studied the effects of cochlear implants on speech. Twenty patients, all using Nucleus 22 implants, participated in this study. Speech intelligi-bility improved in 59%, control of loudness in 94%. Vowel intelligibility, deviation of first and second formants from the norm values and the abnormally high fundamental frequency values improved. Also individual nasality values may improve and decrease was found in the nasalance values for non-nasal sentences.

VIII. Cleft palate and speech
In the Netherlands, with 15 million inhabitants and yearly nearly 180.000 births about 325 babies are born with cleft lip, alveolus or palate (1986). The incidence nowadays is about 2‰ (ranging from 1.42 – 2.03), live and still births included.

Sanders (1934) studied the inheritance: an incidence of 1.05‰ and genetic factors in more than 20% of clefts were reported.

In 1963 Honig published on pharyngoplasty and described a modified Sanvenero Rosselli technique.

Van Gelder (1956, 1965) studied the function and pathology of the soft palate in speech and aspects of nasality by means of radiological and electromyographical methods.

The Groningen cleft palate team (Huffstadt) published reports in 1961 and 1975, Spauwen and Schutte advocated early pharyngoplasty in special cases (1992).

Winters (1975) published on congenital short palate. Of 126 patients with this anomaly 27 cases were operated with Honig's modified velopharyngoplasty.

In 1970 the number of syndromes with schisis amounted to 50, nowadays more than 450 syndromes are known. In 1999 Swanenburg de Veye found that 20% of cleft patients have other malformations.
The chronology of orthodontical and operative therapy may differ between CP teams: most teams perform closure of the lip at 3 months and closure of the soft palate at 9 months. Some clinics close the hard palate at 9 months, others at 1,5 years, or even at 9 years with bonegraft. Preoperative orthodontic appliances are used in some clinics from birth till 1,5 years, for expansion or proprioceptive and feeding effects. Pharyngoplasty at 6 years, or earlier if necessary. Secondary bone grafting of the alveolar ridge is performed at around 9 years of age. At the age of 16 to 18 years final surgical corrections take place, e.g. maxillary osteotomy, correction of nose or lip. In 1989 a number of 19 cleft palate teams was active in Holland, 8 being related to academical clinics. There is recently a tendency to reduce the number of CP teams.

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Professional state

-independent specialty of its own standing no
-official subspecialty to ENT no,
working-group belonging to
-Dutch Society for ENT
(see: association1)
-number of university departments eight (8)
-number of doctors working in the field thirty (30)

Education and training
phoniatrics in the frame of ENT

Associations
Nederlandse Vereniging voor Keel- Neus- Oorheelkunde en Heelkunde van het Hoofd- Halsgebied
Nederlandse Vereniging voor Logopedie en Foniatrie
Nederlandse Vereniging voor Stem-, Spraak- en Taalpathologie
Nederlandse Vereniging voor Fonetische Wetenschappen
Nederlandse Vereniging voor Schisis en Craniofaciale afwijkingen
Vereniging voor Klinische Linguistiek

Oustanding personalities
H. Burger 1864-1957
F.C. Donders 1818-1889
L. Kaiser 1891-1973
H. Zwaardemaker 1857-1930

Selected publications
c.f. references in history article

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