COMMUNICATION DISORDERS

AN INTRODUCTION FOR COMMUNITY-BASED REHABILITATION WORKERS

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Principles of Communication Development or Disorder

Development or disorder

What is communication?

Communication is an exchange of feelings, knowledge and wants between two or more people. It may be either non-verbal or verbal and includes everything from the subtle comfort and exchange between a caregiver and a young child to the sophistication of a lecture delivered to a professional group.

While many animals give evidence of some abilities to communicate, human beings are set apart from other species by the sophistication of their language system for communication. Language and communication are not the same thing. Language is an accrued system of words and rules that makes it the most organized and sophisticated form of communication.

When does communication development begin?

Communication development begins with birth. A baby communicates primarily by voicing or vocalizing accompanied by changes in facial expression and then some gestures, e.g., pointing and looking. The non-verbal sounds at the beginning of life are usually expressions of internal states such as hunger or discomfort that the baby is experiencing. However, these non-verbal sounds are interpreted by people around the baby as

communicating emotions or wants. The early vocal patterns begin to develop the shape of the speech heard around the child during the first year, so the children begin to sound like their English or Chinese or Russian parents. These are referred to as prosodic patterns or intonation. Adults use these patterns to interpret the infant's emotions and needs. In early communication, concern or love is communicated in response by the mother holding, touching or stroking the baby. Often caregivers add words that have a common meaning or order to them. Alternatively, the mother may make up sounds or hum or sing to quiet the child. Children learn about communication through these moments of comfort.

How long does communication take to develop?

Communication skills continue to develop throughout life. Although the most rapid development in communication and language is in the first few years of life, children and adults continue to add new words to their vocabulary, and develop a new range of social skills as they learn to interact and talk with diverse groups of people. In school they acquire the skills of reading and writing as educational demands increase.

How do we know if communication is normal or abnormal?

Some disorders of communication are easily recognized. If a child does not learn to talk, or an adult has a stroke and loses the power of speech, or we hear a deaf person speak and recognize that voice quality is not normal, the disorder is obvious. However, some communication disorders are more subtle. The first sign of a vocal problem may be just a rough sound to the voice as if the speaker has a cold. In the early stages of acquired deafness the speaker may not know how to modulate the voice and it may be either too loud or too soft, or some difficult-to-hear sounds will be omitted from words. There can be no hard and fast definitions. What is required in some cases is to make an assessment about the effect communication has upon the speaker's social, emotional or educational functions. A speaker with a very mild speech problem may feel unable to fully participate in classroom or job opportunities because of the reactions of other people.

In writing this book we have attempted to concentrate on the more severe and obvious forms of communication disorder. These will usually provide the most pressing problems to medical practitioners.

The principles we describe will often be readily applicable to people with milder communication problems. As you develop more skill in listening to patients' talk and in observing their patterns of communication, you will be able to recognize what they do well and what may be hindering good communication between them and other speakers. From your observations and a basic knowledge of communication, you should be able to make recommendations for planning and management.

Principles underlying intervention

Listed below are some of the principles of communication and intervention which we believe should underlie all communication training.

1. *Our ability to communicate makes us feel human.* Inability to communicate cuts off individuals from social and educational opportunities and may well lead to emotional disturbances. Access to the opportunity for communication training is an inalienable right. Every attempt should be made to provide each individual with at least some basic form of communication.
2. *Communication is a process which develops in the context of a two-way interaction.* Young children learn the principles of communication in the give-and-take of everyday routines. To communicate means to acquire the skills and responsibilities of being both a listener and a sender of messages. Rehabilitation programmes need to develop the patients' and families' skills as both listeners and speakers so that the patients have maximum opportunity to participate in a social world.
3. *Communication develops before language, and language is acquired before speech.* Children learn to communicate through vocalization and gesture long before they learn the specific language of their community or talk clearly. The principle of training communication before attempting language and speech goals should be remembered in any rehabilitation programme. In the case of young children the goal is to establish communication first and then to look at a nonverbal or verbal language system. Later on the focus can turn to teaching speech.
4. *Communication need not be verbal.* Much of our communication occurs through tone of voice, gesture or action. The non-verbal part of our messages is more powerful than the verbal part. Patients who are unable to learn speech can still usefully learn to communicate through non-verbal means. Verbal communication may be either written or spoken. In most cases the spoken (listening and speaking) components develop before reading and writing. Reading and writing should only be taught or used when the patient has well developed language skills.
5. *Communication needs change over time.* Patients with communication disorders need regular review to ensure that they have the best system of which they are capable to serve their needs and those who live or work with them. As their lives change, they may need new vocabulary or sentences. They may need to learn more advanced ways to ask questions or to make requests. In the case of progressive conditions they may need careful training or preparation for assistive devices.
6. *Communication disorders may have a neuro-physiological component linked to a specific aetiology and/or a behavioural component associated with learning.* It is important therefore that any rehabilitation programme acknowledges both possibilities. Learning or re-learning will take time; just as it does for any person learning to speak a language fluently.

Principles of Assessment

The clinician seeks to describe adequately the communication problem in order to distinguish it from other problems that it may resemble and to determine its distinctive characteristics. On the basis of observations, findings of the examination, or specific tests and their interpretation, the clinician proposes a remedial programme and attempts to predict its outcome. In carrying out these basic responsibilities one should go through the following steps:

1. *Obtain adequate information about the patient's past development and status.* The clinician should be especially interested in the onset of the communication problem and should obtain information in a number of ways and from a variety of informants, making use especially of a case history or interview.
2. *Obtain a comprehensive and detailed description of the patient's problems and related aspects of the present status.* To achieve this the clinician needs to make considerable use of relevant interview material and also a variety of observations for identifying and measuring relevant aspects of speech, language and related behaviour. These are identified specifically under each section.
3. *Use the information gathered to make a tentative determination of the scope of the problem.* The clinician needs to consider possible hypotheses about the condition and any circumstances that could have served either to precipitate or to maintain it.
4. *Use the facts obtained and the hypotheses drawn from them to formulate an appropriate remedial programme.* In devising the remedial programme, the needs of the patient, the environment, and the variety of caregivers and others who are in contact with the person all need to be considered.
5. *Attempt a prognosis.* By relating the carefully analysed and described specific communication difficulties to any known contributing cause (stroke, cleft palate, hearing loss, etc.), the clinician should predict the probable effect of the proposed rehabilitation on the disorder.
6. *Gather study data.* In order to help a person with a communication problem effectively, the clinician needs to describe the disorder in detail. Among the more useful procedures for gathering data are the following:
   (a) *Questionnaires.* Questionnaires are very useful for gathering information from one person or many people in a brief time. The procedure is economical in providing a record of the answers that are available in a usable form without write-up. The questionnaire can be as comprehensive or as brief as you wish, and by using it you can cover the same ground in each of a series of cases.

       There are disadvantages in the use of a questionnaire. Although uniform coverage of the relevant areas is provided for, you cannot be sure that all the respondents have interpreted the questions in the same way or even that they have understood the main point of

each question. Furthermore the questionnaire method gives only limited guidance in determining areas to be explored further.

(b) *Observation.* By observing, ideally through a one-way window in a room, how a young patient interacts with parents or with other children at play, or how an adult patient interacts with the caregiver, it is possible to gain first-hand knowledge of communication behaviour. Through such observation you can reduce some of the bias which may enter in to a written report. You can also observe those details which are lost in reports and probe specific behaviours of interest.

It is often very useful to try to make some informal observations of patients with family members before beginning a formal interview. Training a waiting room attendant to make some preliminary notes or observations can be most useful.

(c) *Participant observation.* You can carry your observations a step further by yourself participating in the activity of the person you are observing. This may be particularly useful when you are working with young children. You can structure the situation in certain ways so as to make specific observations, e.g. through play. Of course your presence in the activity makes it different from what it would be if someone else was participating or if no one was present to observe. However, making systematic observations of the behaviour of patients with speech, voice, language, or hearing problems is very useful to the clinician.

(d) *The oral interview.* When you interview an informant you operate in a special kind of interpersonal relationship which involves a two-way conversation. Some patients may not be able to do this, or may require extra time and understanding due to their communication disorder. Whatever the problem, it is important to establish mutual trust and confidence at this stage. If information is needed from a family member as well as the patient it is important to include both in the interview by using appropriate communication strategies.

(e) *Formal tests.* Some standardized tests of speech, language and voice may be used for comparative purposes between visits and to compare patients. Since the measures often are culturally biased, results may need to be treated with caution.

Throughout each section in this book, we have given specific information on assessment and differential diagnosis of each disorder. By referring to the suggestions in the sections, you will be able to see how these principles can be put into practice.

2

Principles of Counselling

Introduction

The term 'counselling' encompasses the relationships, skills and processes used when one person helps another with a problem or series of problems. Often this help takes place during a discussion or within an interview. For the rehabilitation of communication disorders we require both counselling and interviewing skills. These will also be useful in all our human relationships whether with family members, friends or colleagues. Counselling skills develop over many years and are dependent on our personalities, interpersonal skills and knowledge. How we apply these will vary a little according to the culture to which we belong; however, the application will make the difference between being an average or excellent clinician. Counselling or helping can include processes which deal with the feelings, thoughts and behaviours of a person. Counselling usually involves two people: the person with a problem and the helper or counsellor. Counselling can also be done in a group format when these roles are less clearly delineated, and people with similar problems may help one another. For example, a group of laryngectomee patients and their spouses may all help one another by sharing their practical problems and feelings and the manner in which they cope with them.

By reading this book you will have some appreciation of both the 'art' (pertaining to feelings) and 'science' (pertaining to knowledge) of counselling, and some knowledge of the personalities, processes and interactions required. The needs of the patient will be addressed along with possible outcomes. Counselling is critical in the management of

communication disorders because communication is the way we express our thoughts and feelings.

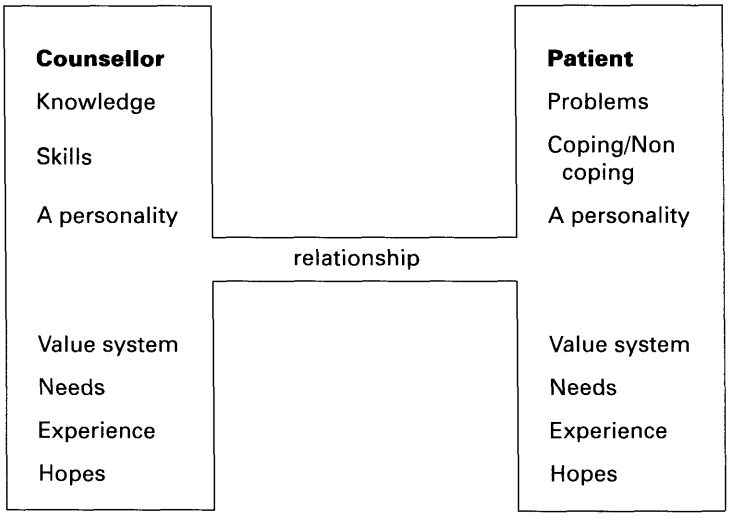
Historically, help was offered by family, friends, and communities, and was built on relationships of care and trust. With the coming of psychoanalysis help became not only scientific but somewhat exclusive. Yet in many ways more and more help was required as the pressures of twentieth-century changes were felt and the influence of the extended family diminished, particularly in Western cultures. Helping skills and education have now been extended across many professions including all those involved with rehabilitation. Without counselling, one cannot make the best use of other specific knowledge and skills. In times of crisis, such as earthquake, famine, war and air disasters, the role of the counsellor has now become clearly identified as one of maximum importance if the long-term effect of such disaster on an individual is to be reduced. The effects of acute or chronic illness and disability need to be managed in a similarly caring manner in order to maximize the effects of rehabilitation. Every professional dealing with handicap requires counselling, caring or appropriate helping skills.

Components of the counselling relationship

1. The counsellor, helper or therapist brings to the task a specific personality as well as a theory base and practical skills.
2. The person with a problem has a specific personality, needs and coping/non-coping capabilities.
3. The outcome of the procedure these two go through together will depend on the interactions of the following components:
   - the personalities of both people
   - the theories used
   - the relationship established
   - the type of problem and prognosis
   - associated difficulties and needs
   - the actions taken
   - the achievements
4. The goal is to help the patient function as well as possible independently.

The relationship

The relationship between the counsellor/therapist/helper and the patient includes the following attributes:



Counselling components in rehabilitation

Each helper needs the skills to be able to:

1. deal with intervention and refer on if necessary (onward referral might be to a specialist doctor, support group or social welfare organizations)
2. cope with the diagnostic period and accompanying feelings of
   (a) shock
   (b) denial (in which the patient may 'pretend' to be coping or refuse to accept a specific diagnosis)
   (c) grief or feeling of hopelessness
   (d) anger (maybe against even the helper whose presence verifies the need and the condition)
   (e) eventual acceptance of the problem
   (These reactions are often delayed or may re-occur in cycles.)
3. identify the problems and all associated feelings, thoughts and behaviours
4. supply information and continuing support
5. shape new behaviours
6. evaluate
7. allow the patient to develop responsiblity and initiative in handling the problem
8. plan with the patient

The counsellor

Brammer (1988) has described the following skills required by a counsellor. They can be used with specific intent (Ivey, 1988) to foster a particular outcome.

Required skills

1. Understanding, including:
   (a) listening, which requires empathy, good non-verbal cues (such as smiles, supportive nods or even a gentle touch), patience and identification of critical information in terms of both symptoms and feelings
   (b) leading, which entails cues to help patients clarify and continue with their explanations or explore further their feelings associated with the presenting problem
   (c) reflecting, which means rephrasing what the patient has said to make sure the problem is mutually understood. (This may also include the introduction of an alternative view or perspective.)
   (d) summarizing or clarifying the main problems and issues, perhaps prioritizing at the same time
   (e) confronting, which is to be used with caution, but is often necessary as when patients continue to deny, avoid the issues or rely too much on the counsellor's help, rather than themselves
   (f) interpreting, which is often required if patients have difficulty expressing themselves or if they have a communication disability
   (g) informing, which is giving the patient information about the condition, or admitting that one does not know but can try and find out if possible (Unfortunately there are many aspects of rehabilitation for which the answers are not yet known.)
2. Intervention, involving:
   (a) supporting the patient emotionally
   (b) shaping new behaviours
   (c) centring of feelings and behaviours (i.e., making patients match their feelings and behaviours, rather than behaving as though they can cope without acknowledging the 'hurt' or anger inside)
   (d) helping build realistic hope but not false hope (e.g., helping stroke patients to realize that they will be able to communicate but not sufficiently well enough to return to work, at least for a long while)
   (e) referring
3. Action, including problem solving, decision making, planning and behaviour change.

Life style of counsellors

The best counsellors, therapists and helpers set an example. They need to:
1. serve as a model or practise what they preach
2. help themselves by avoiding over involvement and stress, etc.
3. broaden their own experiences with outside interests
4. show initiative

Personality traits of counsellors

1. Counsellors need to be very aware of their own personality and the effect they may have on others in terms of:
   (a) projection of own feelings: counsellors, for example, might feel that they would never, in any circumstance, admit their child to a special school, and so might try to convince another parent likewise
   (b) transference: counsellors might have had problems in their own relationships with others, which they then try to 'work out' in their relationship with the patient; or the patient may often put the counsellor in the role of a parent, for example, and then try and work out an aspect of that relationship, that was perhaps missing; all counsellors are particularly vulnerable to this situation
   (c) values: counsellors should not judge others if their educational, social, cultural or political background is different
   (d) feelings (e.g., frustration, joy, pleasure, control, anger)
2. Counsellors should also be conscious of:
   (a) ethics and confidentiality
   (b) changing roles (i.e., allowing the patient to lead and become independent)
   (c) sharing rather than 'being the boss'
   (d) allowing the patient to decide whenever possible, thus enhancing the generalization of the skills the patient will learn

Counselling attitudes

The following attitudes are important to be a successful counsellor:
1. empathy (ability to put yourself in the patient's place)
2. caring
3. trust
4. respect
5. an ability to identify and verbalize the real problem
6. communication
7. situation specific responses (e.g., listening when required, or ignoring undesired behaviours unhelpful to overall progress; for example if a spouse goes on and on about the 'stupidity' of a partner after a stroke, in front of the patient, this should be ignored until the behaviour stops through lack of reinforcement)
8. careful use of non-verbal communication

People who counsel and help also need to be:
1. friendly
2. able to identify with the problems of others
3. able to cope with problems
4. self-disciplined
5. trusting

6. confident
7. ready and able
8. able to express themselves
9. able to listen and communicate
10. non-judgemental

The procedure

The entire rehabilitation process involves all the parameters of helping and overall it will depend on:

1. all the personalities involved: remember communication breakdown usually involves all members of a family in some way
2. the specific communication disorder
3. the knowledge, theory base and skills of the counsellor in terms of both the helping process and communication disorders
4. the client's needs and abilities.

However, within this overall process many directional shifts take place. These relate to:

1. a new balance of thoughts feelings and behaviours related to the presenting communication problem
2. the increase in understanding and coping
3. growing trust and confidence
4. decreasing dependence on the helper
5. improving communication

The stages of the rehabilitation process

These may not always occur in exactly the same sequence but usually involve:

1. the introduction when the client comes and states the problem
2. time spent in establishing a relationship with the therapist or helper
3. assessment — all possible aspects of the problem are identified and explored
4. a plan for the therapy, drawn up and explained to the client
5. treatment — the plan is tried and the relationship continues to develop
6. the outcome, including evaluation and feedback
7. further planning, as a result of which the process becomes cyclic involving progressive goals and achievements
8. improvement, reinforcement and generalization
9. conclusion — the treatment ends when the goal or a plateau is reached or onward referral is necessary

These broad descriptive stages may apply to either one therapeutic session or to the overall process.

The coping skills to shape in the patient

1. to perceive the problem realistically
2. to manage their associated stress
3. to build support networks and maybe seek help from family, friends or other professionals
4. to build problem solving capabilities
6. identification and description of feelings and thoughts

SUMMARY

Counselling and interviewing, which is a part of all rehabilitation therapy, requires a sound theory base, a particular personality, and a number of skills on the part of the counsellor. The process involves establishing a good relationship and the specific identification of the problems, feelings, needs, and coping capabilities of patients. The goal is to assist patients toward independent responsibility and the full realization of their potential and to be able to function within the framework of the presenting situation. Counselling skills are critical in all areas of rehabilitation but are of paramount importance where any breakdown in human communication is involved.

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6

Speech Problems

Introduction

Speech is the primary means by which most people convey their language — or mutually understood code — to others. In terms of assessment and remediation, it is important to understand the difference between speech and language. By speech we mean the articulatory process through which sounds and words are produced in the vocal tract. Speech and language are mutually dependent and therefore care must be exercised in considering them as separate entities. Speech includes both the perception and production of sound. Speech perception is a complex function heavily dependent on the *hearing* and *processing* of sound sequences according to the rules of a given language. Sound can be discriminated, described or reproduced according to its acoustic properties. Those people who have difficulty with speech discrimination and processing will usually have trouble with speech production. Speech production is a motor act involving the use of the lungs, larynx (vocal cords/folds) and organs of articulation in the mouth. Speech production includes respiration, phonation, resonance, articulation and prosody; each of which will be discussed individually. Speech perception is dependent on the auditory cortex of the brain but the two primary centres for speech production are in the left hemisphere of the brain in most individuals.

People of all ages can suffer from speech disorders. These may result from many different aetiologies of either central or peripheral origin. They can be caused by neuromuscular or orofacial disorders and pathologies as well as by hearing loss or emotional and developmental problems and delay. Even a comparatively mild speech disorder such as a lisp can have a

profound effect upon an individual's life and ability to communicate. Many speech disorders can be overcome with appropriate remediation.

Medical background

The anatomy and neurophysiology of the peripheral and central hearing mechanisms associated with the perception of speech are briefly described in Chapter 8, Hearing Disability.

Anatomy of the peripheral speech mechanism

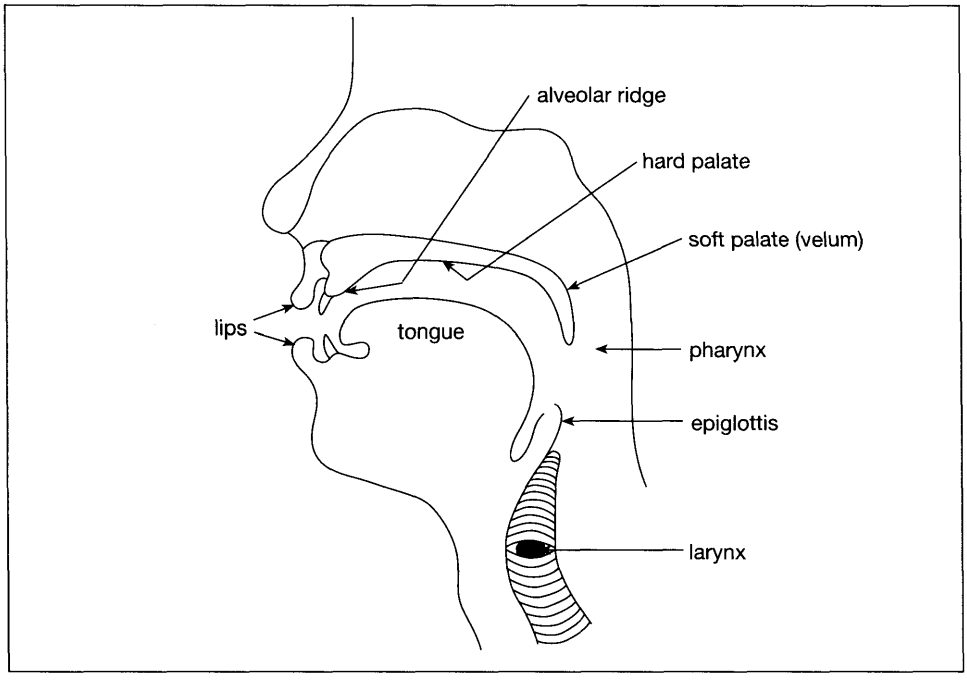

Figure 6.1 The principal organs of speech production.

Speech production depends on air being forced up from the lungs by way of the trachea and into the **vocal tract** which contains:

- the larynx
- pharynx
- tongue
- soft palate
- hard palate
- teeth
- lips

Speech production

1. The respiratory system builds up the air flow.
2. The sound produced by the vibrations of the vocal cords is eventually forced out through the mouth and influenced by the position of the various speech organs in the mouth.
3. The amount of air pressure below the glottis (the opening between the vocal cords) will contribute to the loudness of the voice.
4. The length and vibration of the cords will affect the resulting pitch of the voice.
5. The pharynx acts as a resonator for the sound.
6. The rapidly changing positions of the lips, teeth, tongue and soft palate will influence the air flow and produce the vowels and consonants that we recognize as speech.

The central speech system

1. Sensory information from the orofacial region and vocal tract is provided by branches of the trigeminal (5th), facial (7th), glossopharyngeal (9th), vagus (10th) and hypoglossal (12th) cranial nerves.
2. The thalamus is the major relay centre for the sensory information to be transferred to the speech areas of the cortex.
3. The two primary areas of the cortex to be involved in speech (and language) are Broca's Area and Wernicke's Area, both of which are located in the left hemisphere of the brain.
4. The sensorimotor cortex exercises control over voluntary movement of the speech mechanism.
5. Both the pyramidal and extrapyramidal systems are important to speech; abnormalities in these systems may cause speech disorders.
6. The cerebellum is important for motor control of speech; its dysfunction may produce the speech disorder known as dysarthria, characterized by an inability to articulate clearly.
7. Nuclear groups of the brainstem provide the final common pathway for signals sent from the cortex to the cranial nerves serving the speech mechanisms.

Pathologies resulting in speech disorders and their medical management

Speech disorders can be caused by:

- hearing loss
- pathologies of the central auditory system
- pathologies of the central speech system
- problems with the peripheral mechanism

- orofacial anomalies
- developmental problems
- emotional problems

Specific medical management for many of the resulting disorders is discussed in the relevant chapters on hearing loss, cleft palate, voice disorders, stroke and the non-verbal patient. Many speech disorders also respond well to the process of rehabilitation, re-learning through speech teaching and practice.

Assessment and differential diagnosis of speech disorders

This process requires a thorough understanding of:

- the anatomy of the speech mechanisms
- the central and peripheral systems and their neurophysiology and pathologies
- the acoustics of speech
- the phonetics of speech
- normal speech development
- childhood speech disorders
- adult speech disorders

The first two of these have been briefly addressed; the remainder will now be discussed.

The acoustics of speech

All sounds, including speech, have three dimensions by which they can be described: intensity, duration and frequency.

1. **Intensity** is the loudness or strength of a sound and is measured in decibels. (For more detail, see Chapter 8.) Intensity not only varies between speech sounds but can be very important in determining meaning. For example, we may stress an important word in a phrase. Altering the stress can change the meaning, even when the actual words remain the same.
2. **Duration** is the length of a sound and each speech sound has its own particular characteristic in this dimension. On the whole, for example, consonants are shorter than vowels. The duration of the silences within connected speech are also important and often relate to a grammatic boundary, for example, the break between two sentences. In this case the duration of the absence of sound is also important in spoken language.

3. **Frequency** describes the pitch of the sound and is measured in hertz (Hz). Each speaker has his or her own **fundamental frequency** relevant to the size and shape of the vocal tract. A child's voice is therefore higher than an adult's, and a man's lower than a woman's. The range and direction of the pitch patterns we use are very important as a conveyer of meaning. Each sound we utter also has its particular characteristics brought about by the changes in the shape of the vocal tract and organs of articulation. Each sound does not consist of a single pitch but of a series of **harmonics** one octave apart, each of which is called a **formant.** The first two (lower) formants of a given sound are the strongest and carry much of the acoustic information necessary for the recognition of that sound.

Each of these dimensions can be measured both objectively with instrumentation and subjectively by a listener. Children learning to speak not only hear the speech of others according to these characteristics but also listen to themselves (auditory feedback) in order to learn, monitor and adjust their speech. Likewise people with a progressive hearing loss are unable to adjust the acoustic properties of their speech through auditory feedback, and the quality of their speech begins to deteriorate.

These three major acoustic properties of speech along with the individual formants of each sound can be measured by means of a spectrogram and recorded on a spectrograph. They apply to both the *phonetic* or *segmental* aspects of speech (i.e., in the description of each particular sound) and the *prosodic* or *suprasegmental* aspects (i.e. relating to the intonation patterns of connected speech). Research suggests that at least 75% of our understanding of a spoken message is dependent on the prosodic or intonational component. Therefore, disorders affecting any of these acoustic properties can have a profound effect on both the specific articulation of speech sounds and overall communication and intelligibility of speech.

To produce speech we need to hear and feed forward these acoustic properties and then integrate the information with the motor act of speech production (movement of the organs of articulation) to produce the sounds or series of sound of a given language according to its linguistic code.

The phonetics of speech

This is the science by which speech sounds can be described and transcribed according to their method of production. The three categories of description for the consonants of speech are: manner, place and voicing.

1. **Manner** describes how the articulators are placed to interrupt the flow of air from the larynx. For example, for the sound /p/ the air flow is completely stopped to produce a plosive consonant; but for the sound /s/ the air flow is continuous even though its passage is restricted to

produce a fricative consonant. For some consonants such as 'ch' the air flow is both stopped and then restricted to produce an affricate consonant. For nasal sounds such as /m/ the soft palate is unraised to allow the air flow to pass out through the nose.

2. **Place** describes where in the mouth the articulators meet. It can be:
   (a) labially, meaning the lips make contact
   (b) labio-dentally, meaning the approximation of the teeth and lips as for /f/
   (c) alveolar, meaning the raising of the tongue to the alveolar ridge behind the teeth, as for /t/
   (d) velar, meaning the meeting or approximation of the back of the tongue with the palate (see Figure 6.2)
3. **Voicing** means whether the consonant is voiced as for /d/ or unvoiced as for /t/, the latter being audible from air flow and release rather than voice. In some languages the presence or absence of aspiration (air flow) is an important distinctive feature.

Each speech sound can be individually described and then transcribed according to these characteristics or properties. By using the International Phonetic Alphabet one can see a symbol and should then be able to describe the three major properties of the sound represented. Each sound therefore has its distinctive features by which it is described, e.g. /d/ means a voiced, alveolar stop.

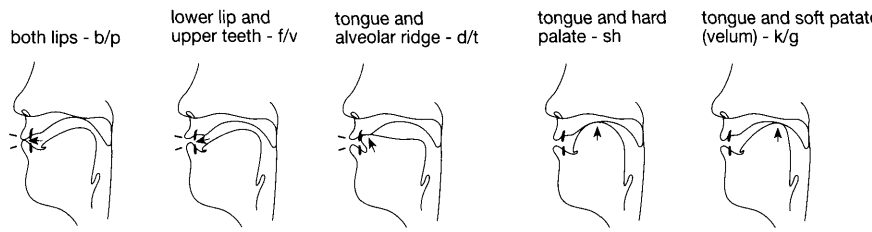

Figure 6.2 The place of articulation of consonants.

Learning or acquiring all the features of one sound is a process. It is a normal part of the process for children to learn some of the features before others, for example to master one 'place' of articulation before another. They usually start pronouncing labial sounds before velar, or they might learn the place and voicing of a sound before the manner, in which case an /s/ could sound like a /t/.

For the rehabilitation of disordered speech both correct and incorrect consonant production can be described in terms of distinctive feature and/or process analysis.

Vowels and diphthongs are slightly different as they are produced with the mouth open and do not require the air flow to be stopped or restricted. Nonetheless they too are shaped by the movement of the tongue, lips and jaw; each sounds different because of the different shape of the vocal tract (see Figure 6.3). The pitch of vowels varies considerably according to the consonantal environment, so for example the 'oo' in /moon/ will be very different from the "oo" in /shoot/. This is because the tongue position will change very slightly according to the context of the vowel. Vowels are described phonetically by the place and height of the tongue in the mouth (see Figure 6.3) and each has its own phonetic symbol for purposes of transcription.

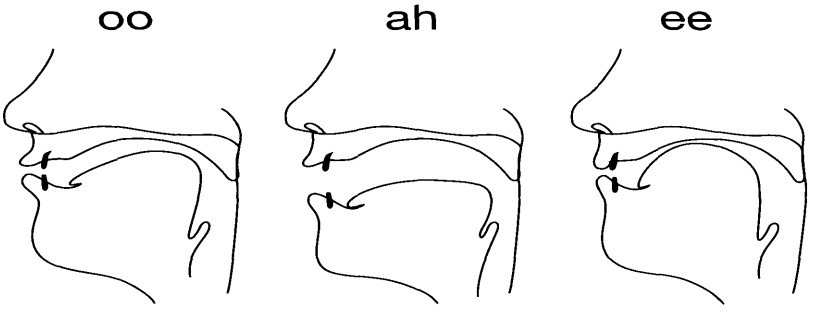

Figure 6.3 Tongue position of three major contrasting vowels.

SUMMARY

Speech can be described both acoustically and phonetically. Sound can be categorized according to the three dimensions of intensity, duration and frequency. All of these properties are critical to spoken language and its meaning. These characteristics are the suprasegmental or prosodic components of language. These properties of speech can be measured objectively with a sound spectrograph. Subjective evaluation and description is also possible. The segmental aspects, or specific sounds, of speech can be described and transcribed through the science of phonetics. The description of each speech sound, whether consonant or vowel, is made in relation to the position of the organs of articulation in the mouth. In the case of consonants each sound is described according to its manner, place and voicing components; whereas vowels are described according to the height and position of the tongue in the mouth. Every speech sound can be transcribed according to the International Phonetic Alphabet.

Normal speech development

Speech development is an integral part of overall language acquisition and should not be considered separately from it. For example, many children may have the motor capability to produce specific speech sounds but they may not use those sounds correctly in words or sentences. Conversely, a child may have developed good language skills but not have the speech mechanisms or capabilities to convey those skills in the spoken form, as in some cases of cerebral palsy.

During the first few weeks of life, an infant normally develops both intonation and speech skills at random, but this development is soon shaped and organized into meaningful behaviours through interaction with the environment and people around.

1. *Development of intonation.* According to Crystal (1984), the development of intonation may follow a specific staged hierarchy.

   Stage 1. Firstly the infant utters sound which may be biologically determined but even at this stage this can be interpreted and can mean pleasure, discomfort or recognition, etc. The infant later learns to vary the intonation patterns to match the situation and to produce the desired response.

   Stage 2. At about two months, the infant may also begin to interpret contrasts in an adult's intonation, particularly in terms of vocal range and, slightly later, vocal direction. At this stage it is difficult to determine the role of loudness and duration. The vocalizations begin to be truly interactive and the beginning of turn taking is established.

   Stage 3. At about six months, the infant's vocalizations become much more varied and begin to resemble those of the mother tongue of the child. Utterances begin to sound meaningful in terms of the 'contours'of the intonation. There are contrasts in stress, duration and pitch patterns which gradually become systematized. Utterances may sound like one or two syllables, or even a chain of syllables, with differing stress and intonation patterns.

   Stage 4. By the second half of the first year, a child may offer recognizable intonation patterns which may for example represent a question, greeting, statement or demand without necessarily using recognizable words as such. The meaning is carried by the intonation contours and characteristics. The vocalisations are now closely linked with the non-verbal communication such as pointing, localizing and eye gaze. During this stage, the child begins to use contrasting pitch patterns beginning with falling, gradually contrasting this with rising and then developing complex compound patterns between the first year and about 18 months. All this intonation or suprasegmental development is gradually included with the segmental or sound production which coincides with the child's first words at the same stage. The development of intonation is critical to meaning. In tonal

languages it is possible that meaningful distinctions begin at this stage or earlier.

2. *Development of speech skills.*
   Stage 1. Speech skills develop alongside intonation and begin with random babbling in the same way. In the early stages, vocalization means the production of many vowels with which the infant soon produces labial sounds such as /m/ and /b/ when the lips are together. It is not surprising therefore that in many languages, repetition of the babbled sound /mama/ later comes to mean 'mummy' as one of the first 'meaningful' words. Likewise, /papa/ or /dada/ means 'Daddy'.
   Stage 2. Many sounds follow although usually plosive consonants such as /t/ and /d/ and /k/ and /g/ are earlier in the process than fricatives such as /ʃ/ or 'sh' and /s/. From very early these consonants are said with a vowel and repeated in such syllables as /mama/ with the consonant being produced before the vowel. The contextual cue, the child's actions and the interpretation of the listener soon help to attach meaning to the infant's speech attempts.
   Stage 3. Gradually the child adds more and more distinctive features to sound production. For example, the distinction between the voiced /b/ and the voiceless /p/ is made in the labials, or the stopped and voiced /d/ and continuous and nasal /n/ made in the dental position. The vowel environment for the production of the consonants will also vary, and a final consonant will be heard such as /umumum/. The child enjoys the feel of babbling and during the second half of the first year can often be heard at vocal play. This is most important to speech production. Absence of babbling can be a key risk factor in determining speech and/or language disorders.
   Stage 4. The child begins to use certain sound sequences meaningfully. For example, a simple /da/ may represent /thank you/ when given an object, or /tis/ may sound like /here it is/ when the child gives an object, or /awga/ may mean /all gone/ when food is finished. At the same time, new series of sounds and sound blends may be heard in the child's babble. This will include a mix of vowels, diphthongs (two vowels together), consonants and intonation patterns, e.g., /agaboo/ or /bouwa/ with compound pitch and stress on the final syllable.

From this stage the child's sound repertoire gradually increases and is incorporated into the spoken language. Complete mastery of all sounds in a language may not be completed until a child is five or six years old.

When considering children's speech development it is important to remember its complexity, particularly in association with language acquisition and the development of meaningful intonation. It is also important to remember that a sound which may sound 'wrong' to an adult, may in fact be nearly right, because the child has completed part of the process correctly and learned some of the distinctive features of the sound. For example, a

child who uses the consonant /t/ correctly but also in the place of /k/ and /s/ in connected speech may be going through a normal developmental process. That child has learned that a voiceless stop is required for both /t/ and /k/ and now just needs to learn the place of articulation. In the case of /s/ the child has the place and voicelessness right but the manner needs to change from stop to continuant. Too much correction may confuse the child, for we do not yet know about how the child discriminates between the features. However, correct speech production and models for the child are important, along with attentive listening and interpretation by the caregiver when necessary.

SUMMARY

Biological factors may determine the infant's first utterances, but these can be interpreted from the earliest days of life. Both intonation and articulation develop randomly at first but are soon systematized meaningfully. Even as early as three months a child's vocalizations will discriminate between pleasure, discomfort, interest and recognition. Gradually, the child's intonation patterns including stress, pitch, range, and direction and duration of sound begin to sound like the mother language in contours. At the same time the child's random babbling and production of speech sounds becomes practised in vocal play and intentional through interaction, with an ever increasing repertoire of features and sounds being introduced as spoken language. The entire process will take up to five or six years. Too much early correction is contra-indicated.

Problems in children

Children suffering from specific aetiologies such as cleft palate, hearing loss, cerebral palsy or mental retardation will suffer from speech disorders which are addressed in the relevant sections of this book. However, there are children who demonstrate delay, difficulty or difference in the development of speech, for no such easily determined reason. The errors of all children, however, fall into five main descriptive categories or a mixture thereof:

- omission of sounds
- substitution of one sound by another
- distortion of sounds
- addition of sounds
- abnormal prosody

The reasons for these problems can be specific or diverse and be attributed to:

- difficulty with sensorimotor skills
- faulty learning or interactions
- psychological factors
- phonological (language) problems

Assessment of childhood speech development and disorders

This requires detailed knowledge of normal communication development and must always be considered within the framework of spoken language rather than discrete speech performance. Assessment may involve a battery of procedures and instruments. Initially only a screening test is required to determine whether a full battery is necessary. The latter necessitates a complete case history, consideration of all associated developmental, sociological and psychological factors, along with a hearing and language screening and orofacial examination. The latter should check for abnormalities in the structure and function of the oral mechanism.

Speech evaluation

Speech evaluation requires some or all of the following:

- analysis and recording of conversation
- administration of standardized tests
- measures of stimulability
- deep tests of processes and features

Whichever of these methods is used to determine the baseline for intervention, phonetic transcription is the means by which the errors are transcribed and recorded systematically. The resulting errors can then be classified (omissions, substitutions, deletions, patterns of features or processes, developmental criteria, etc).

1. Analysis of a child's natural spontaneous conversation may produce *representative* errors. Exact transcription, however, may be difficult, time consuming and require skill.
2. Standardized test stimuli are prepared and easy to use but may not be applicable or available for given populations and may not result in representative results.
3. Establishing stimulability is often helpful in determining baselines, potential readiness, prognosis and methods of intervention.
4. Deep tests will provide valuable information related to coarticulation.

Childhood speech disorders

Other than those speech disorders associated with specific aetiologies such as deafness, mental retardation or cleft palate, the four main childhood speech disorders are:

- articulation disorder
- phonologically based disorders
- dysarthria
- dyspraxia

1. **Articulation disorder** is usually of functional origin and may be characterized by a variety of deletions, substitutions and omissions, ranging from mild to severe and with or without associated language problems. The child may be having difficulty at a peripheral level in using the speech organs.
2. **Phonologically based speech disorders** may sound similar to the above but the child is having problems centrally particularly at a linguistic processing or organizing level, and has not yet grasped the coding system for sounds.
3. **Dysarthria** is a speech disorder of neurological origin affecting the speech musculature and movement, and is particularly prevalent with cerebral palsy. Swallowing may also be affected.
4. **Dyspraxia** is also a disorder of central origin in which the child has problems with volitional movement and cannot imitate.

SUMMARY

Childhood speech disorders can be characterized by different patterns of errors and differing degrees of severity and intelligibility. The reasons for the difficulties may be central, peripheral, developmental, learned or psychological. Assessment can involve four main speech analysis procedures to establish the type and degree of the disorder and to help establish baselines for management. Disorders usually can be classified according to four main types.

Adult speech disorders

These are usually associated with:

1. orofacial disorders
2. hearing loss
3. stroke and resulting dysarthria and dyspraxia

4. progressive disease of neurological origin
5. ageing

The management of speech disorders

Most practitioners will choose one of the following models of management of speech disorders according to the needs and type of the presenting case:

- sound discrimination training
- sensorimotor sound production training
- operant conditioning
- psychological aproaches
- phonologic training

Whichever of these the clinician utilizes, the process is likely to include five main components:

- recognition of error
- structured production practice
- spontaneous inclusion of new target
- retention of new behavious
- generalization of new behaviour

1. *Sound discrimination training* may involve providing:
   (a) the child with opportunities to distinguish between the correct and incorrect sounds in a particular linguistic environment and
   (b) the opportunity to distinguish between two similar sounds, processes or features of a sound at different levels of complexity (syllables, words or phrases).
2. *Sensorimotor training* is useful for children having difficulty with the movements of speech production. Information, demonstration and practice is given as to how sounds are produced.
3. *Operant conditioning* may help overcome faulty learning and assist motivation. This approach may also consider caregiver reinforcement, etc. Principles of reinforcement are critical to all methods of intervention.
4. *Psychological approaches* may help the child to perceive the need to communicate and help with motivation. They may also help caregivers to interact productively.
5. *Phonologic approaches* utilize knowledge of normal developmental articulatory errors and simplifications, and match these with the simplifications made by older children with faulty articulation. The child's repertoire of features and sounds is then gradually increased following normal hierarchies of acquisition even if delayed.

Planning treatment

1. All intervention will require careful planning and evaluation, and will depend on the original, ongoing and repeated evaluation processes. Intervention may also be used as a form of diagnosis in some cases. Treatment will depend both on the viewpoint and findings of the clinician. Success will be heavily dependent on maintaining the interest and motivation of the child.
2. Planning, in an organized manner, will depend on the clinician's knowledge of child speech/language/communication development, acoustic and phonetics.

   Caution: A real danger is that too much attention and selective reinforcement may be given to speech production without the adequate prerequisites being present. For example, reinforcing for correct or incorrect sounds when a child may be confused at a semantic or syntactic level (see Chapter 7, Child Language Problems) may be counterproductive and extinguish motivation to communicate. Similarly, attention to a late developing sound such as /s/ too early when a child is only just able to master the alveolar plosive may also be dangerous. Conversely neglect of speech errors may lead to their reinforcement through habituation, and compound or contribute to later learning difficulties. Too much attention to accurate speech production for children with multiple difficulties may also be counterproductive.

Given such problems it is often advisable to assess the child over a period of time to establish the trend in speech acquisition before planning and implementing treatment. The clinician may find spontaneous improvement is occurring. This would then need continued monitoring rather than active intervention.

Treatment

Usually treatment includes:

1. the selection of a target sound (e.g., k), group of sounds, features or processes (e.g., velar, voicing)
2. listening and information as to correct production
3. imitation with careful reinforcement, remembering that even if the sound is still incorrect some features may be correct
   (Note that at this stage repeated failure should be avoided and could mean that the prerequisite stages need attention, or inadequate strategies have been employed. Also, imitation is contra-indicated for most children with dyspraxia who will respond better to language-based elicitation.)
4. spontaneous production with continued shaping by reinforcement
5. self-monitoring and correction
6. production of goal in increasingly complex language and settings
7. generalization and retention in spontaneous conversation

Evaluation

This can follow a pre- and post-test format, or as repeated and ongoing measures, and can include any of the procedures described for the original assessment. Persistent difficulties will require careful reevaluation.

Model of management

Preliminary assessment, selection of children for intervention, choice of therapy strategies and evaluation will require a sound theoretical base. However, implementation of therapy can be demonstrated and then effectively carried out at a community level either in group format or with the assistance of teachers, parents or trained aides.

SUMMARY

The management of speech disorders requires careful assessment, planning, reinforcement and evaluation. Knowledge of both normal and abnormal speech development, acoustics, phonetics and phonology is essential to initial selection and planning. Prerequisites in overall communication development are critical. Intervention that is too early and too selectively negative, as well as neglect, can be dangerous to outcome. Treatment can draw on five specific approaches or techniques and usually follows a predictable hierarchy. Management of speech disorders should only be considered within the framework of overall communication. Implementation of specific intervention strategies can be carried out at a community-based level.

References

Crystal D (1984). *Clinical Linguistics.* New York: Springer-Verlag.