Resource Manual for Commissioning and Planning Services for SLCN

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CONTEXT

The aim of this section is to set out the context for this resource. This work forms part of a range of tools which can support leaders with service planning and delivery, in line with both government and local priorities.

It is essential for service providers to demonstrate quality and productivity and to:

- show value for money
- be able to provide a strong financial argument for the need to invest in services for people with speech, language, communication and swallowing needs
- demonstrate improvements in outcomes for individuals, families and society

Value for money is not about being the cheapest option but about delivering the most return (impact, best outcomes) for a given investment over time.

The key drivers for change to services include:

1. The broad context, which can be divided according to the following factors:

- **P**olitical and **L**egislative factors
- **E**conomic factors
- **S**ocial factors
- **T**echnological factors

2. The near or local context, including:

- Localised policies
- Addressing local needs
- Service provision
- Workforce
- The evidence base

THE BROAD CONTEXT (**MACRO-ENVIRONMENTAL ANALYSIS): FACTORS FROM THE WIDER WORLD**

The Macro-environmental analysis commonly takes the form of a PEST analysis:

Political and legislative factors
Economic factors
Social factors
Technological factors

Political and legislative drivers

Devolution has resulted in changes to the powers of the different institutions across the UK.

The government in power at Westminster maintains responsibility for policy and legislation in relation to key areas including: tax, benefits, foreign affairs, international development,

trade and defence for the four countries of the UK. Government in Westminster is also responsible for health, social care and education in England, but these areas are devolved for Northern Ireland, Scotland and Wales.

As a result of devolution, each country of the UK may have different parties in power, with the possibility of increasing powers in the future. The impact of this is the diversification of policy and direction of travel.

Legislative drivers

The main areas of UK-wide legislation that are relevant include the following themes:
- Human Rights
- Disability Discrimination
- Equality

Though there is different local interpretation, these far-reaching legal instruments define the rights and responsibilities of people and those commissioning and providing services for them.

Public protection has also been strengthened through the introduction of registration of professionals, for example, through the Health Professions Council.

There is separate legislation relating to health, education and social services in each of the devolved administrations in England, Northern Ireland, Scotland and Wales.

Economic

The current challenging economic backdrop will have a significant impact on the financing of public services, with local planners and commissioners prioritising services which are value for money, evidence based and releasing cash through innovation.

Social

In order to plan and deliver services, it is essential to identify the demographic factors relevant to speech and language therapy (SLT) and the challenges that these bring.

- The population is aging: people are living longer.
- The birth rate is falling: most families are having fewer children
- The infant mortality rate is also falling, with more children surviving premature birth or health problems or injury in infancy.
- The urban population is growing.
- The proportion of the population in employment is falling.
- The proportion of the population with English as an additional language is increasing, particularly in urban areas.

THE NEAR OR LOCAL CONTEXT

Localised policies

Central to the new reforms is the emphasis on local decision-making within a national framework. Across the four countries of the UK there are requirements to provide services to accord with local need and influence. In England there is a particular focus on increasing the range of potential providers (plurality of provision) with commissioners having a role to stimulate the market.

For each country, arrangements have been established to assess whether commissioners are achieving better health outcomes for the local population. Part of this process will be an assessment of how well commissioners are performing against specified competencies/indicators/targets. For example, in Northern Ireland these targets are based upon high-level outcomes linked to local strategies.

With the devolution of power to local levels, there is a focus on developing more robust accountability. There is an emphasis on joint working to support integrated commissioning, service planning and provision across health, social care and education.

There are different approaches to this development with different structures and commissioning and performance management arrangements being established across the UK. The dominant theme in strengthening accountability is “putting service users at the centre” with respect to:

- Access and self–referral
- User voice at strategic to operational to individual case management
- Population/local engagement
- Information and advice for users, parents/ carers
- Patient Rights
- Self management of conditions

Some localities will be commissioning or planning speech and language therapy services as a single service whilst others will be commissioning integrated services, cutting across traditional boundaries, with health services integrated with education or social services. In many areas, this has already happened for children's services.

It is recognised that, often, no single agency can deliver best outcomes for their service users by working in isolation. Joint commissioning is advocated wherever the meeting the needs of individuals requires contributions from a number of agencies.

Similarly, some service planners or commissioners will be organising services around disease groups, such as services for persons who have survived a stroke. In either case, it will be important for speech and language therapy managers to liaise with other services to ensure that SLT provision is incorporated in their service plans.

Special arrangements are in place for commissioning services for unusual, low incidence or costly interventions. Speech and language therapy managers should identify the specialist commissioning procedures that may be required for individuals requiring

particular interventions such as costly augmentative communication aids, protracted or intensive interventions.

Addressing local needs

In general terms, the UK is experiencing a number of long-term demographic changes (some of which are identified above).

There is significant local variation within these general trends. It is important to understand what these changes and variations imply in relation to the provision of local SLT services. Other local factors to be taken into consideration include: employment, cost of living, housing, transport and, particularly, levels of deprivation.

There are information resources available online from which planners, commissioners and providers can find out more about local and regional demographic factors. Some of these can be found signposted on the RCSLT website www.rcslt.org .

Local public health teams will also be able to sign-post local services to relevant data and information for their area.

There will also be learning from data collected by services. The RCSLT has developed an online tool called Q-SET, the Quality Self- Evaluation Tool to help you collate local SLT service derived information http://www.rcslt.org/resources/qset . Q-SET should be used alongside national and local data to support service planning and evaluation of service delivery.

Through completing Q-SET, provider services can:

- use the resource every 9-12 months to review progress in meeting action plans and to demonstrate service enhancement
- compare their service with other similar service types e.g. urban, rural, acute, community, adult, paediatric, education, 3rd sector
- demonstrate that their service meets the needs of the service users
- identify areas of strength and generate action plans relating to areas of development.
- submit the results as part of the evidence for a clinical audit
- retain ownership of the monitoring and development of services ensuring that strong professional standards are maintained in the context of multi-agency teams

Service providers completing Q-SET will support commissioners to:

- reduce the 'postcode lottery' of service availability and quality
- have high quality information that is relevant and accessible
- have an overview of developments, trends and initiatives within the service
- have accurate and timely statistics to support performance management and monitoring
- collect data to contribute to the debates on benchmarking. Where benchmarks do not yet exist Q-SET will enable Commissioners to contribute to this in the future
- collect examples of good practice to inform other pieces of work and the development of services as a whole.

Locally derived information will help SLT services to illustrate:

- the numbers of patients/clients seen
- sources of referral
- amount of resource used in providing a service to the client e.g. number of sessions and skill mix
- nature and severity of the disorder, disability, psychosocial impact at the onset of intervention
- nature and severity of the disorder, disability, psychosocial impact at the completion of intervention.
- level of satisfaction with the service.

Service provision

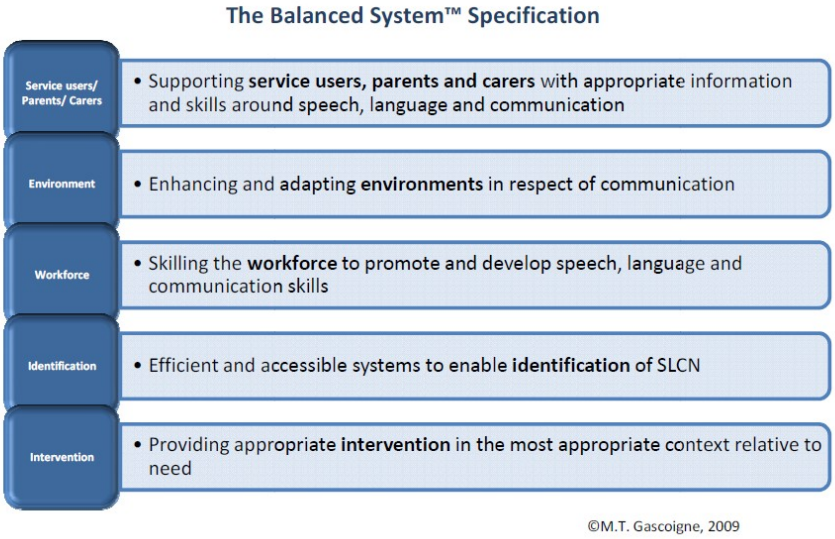
Speech and language therapists have a role in delivering specialist and targeted support to clients, carers and their families. Speech and language therapists can also reduce long-term demands on services by addressing immediate needs that arise from circumstance rather than underlying impairment. Providing training for the wider workforce is integral to the speech and language therapists core role, as outcomes for people with speech, language and communication needs SLCN are improved when the whole workforce is able to contribute appropriately to care pathways.

SLTs also work with the wider workforce contributing to the public health agenda, promoting health and well-being in respect of communication and swallowing. There is little awareness outside the profession of the role of speech and language therapists in preventing the development of speech and language impairments and the further impact and consequences of different speech, language and communication disorders upon health, education, social integration and employment.

The challenges of meeting the speech, language and communication needs (SLCN) of a given population are best understood through a social (participative) model. Key elements of a total service specification will start with:

- identifying the needs of the service user, parent or carer for support and information
- identifying/assessing and diagnosing specific SLCN and providing appropriate intervention.
- considering needs of service users within the environments they encounter
- training the wider workforce that interfaces with them to maximise opportunities for positive outcomes.

The balanced system (diagram 1) below illustrates the wider context for how SLTs contribute to this range of activities. The needs of service users should be considered in service specifications. The role of SLTs in supporting the active participation of service users in service planning, adapting the environment and enskilling the workforce is as relevant as the SLT role in identification and intervention.



Workforce

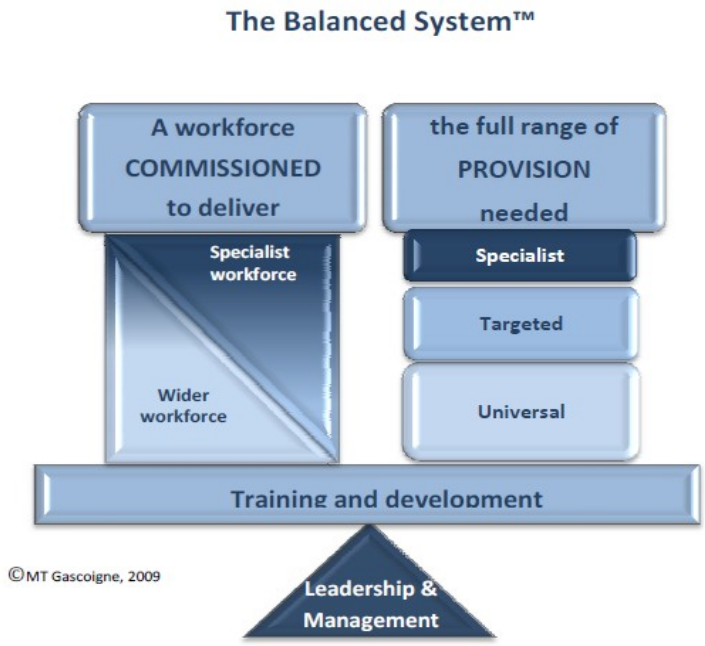
Careful planning of services, including joint commissioning, will help to shape the workforce and inform the skill mix required to deliver high quality services, improve outcomes and support value for money. Because the commissioning and planning of services relies on the evidence base for a given type of SLCN or model of practice, it is essential that clinical and managerial expertise from speech and language therapists is available to support innovation and quality of service design.

Speech and Language Therapists, as part of the wider workforce, may be employed by a range of organisations, including the third sector, social care and education or be working as private practitioners.

Equal Access to services is of importance to local decision makers. Local demographic profiling will inform workforce requirements. For example, bilingual staff and support workers are required in most areas to meet the needs of diverse communities. The appropriate skill mix should enable services to be family-centred and be culturally and linguistically appropriate and responsive. It may be necessary to consider increasing home delivered services or providing services in unusual locations.

The RCSLT also acknowledges the important role that Assistants and Support Workers have in the delivery of effective speech and language therapy services. Assistants and Support Workers are integral members of both speech and language therapy and multi-disciplinary teams, engaged in a wide range of clinical settings with diverse client groups, duties and responsibilities. http://www.rcslt.org/aboutslts/rcslt_statement_v3.pdf

In order to support more effective use of skill mix, SLT services also need to provide education and training of the wider workforce and not be focussed solely on direct patient / client care. For all services, this is critical to secure the appropriate balance of cost-effective universal, targeted and specialist services.



PRACTICAL CONSIDERATIONS

Many people involved in strategic planning, commissioning or reviewing services will not be familiar with speech and language therapy, its objectives, the needs of clients requiring speech and language therapy, the principles driving the profession, or the evidence base and the following points may support people.

- Where possible, draw on the evidence base.
- Communicate clearly and succinctly.
- Avoid using acronyms and provide a glossary of terms.
- Do not assume knowledge of local arrangements or the requirement to interface with other agencies
- Set your service in the context of local priorities.

The RCSLT's Communicating Quality 3 (CQ3) provides clear guidance on care pathways, clinical standards and issues related to quality assurance. This information should be used in submissions to support commissioning quality services.

The following guiding principles have been adopted and apply to all client groups. Services are to:

- be family centred and culturally and linguistically appropriate and responsive
- be comprehensive, coordinated and team based
- work with and communicate effectively with other services meeting the needs of the client
- be evidence based
- ensure equal access
- involve the family and carers
- include training and education of co-workers
- ensure practitioners continuing professional development and appropriate support.

Evidence of the impact of the service will be important to commissioners and providers. Providers will need to demonstrate the impact of their service, particularly when services are being reviewed. Determining the objectives of the service will support the process of outcome measurement. SLT services will need to provide information on outcomes achieved and levels of client satisfaction. Some of this information can be gathered through use of the RCSLT's Q-SET tool, as detailed above.

Managers of speech and language therapy services will need to equip themselves to engage effectively and positively with those who are commissioning or monitoring services. They will need to:

- identify who is commissioning or responsible for overseeing different services. For example, health commissioners may be working with commissioners for education/head teachers. It is important to identify who is taking the lead for each aspect of the service delivery in the locality.
- establish good working relationships and effective communication with those commissioners and planners for their area of responsibility.
- be aware of local priorities and commissioning plans and strategies.
- have a good understanding of the commissioning/planning/monitoring framework for the locality
- be equipped with local data, knowledge and evidence to the tendering process
- be clear of the unique contribution of the service to improving health, employment, education and social outcomes
- be able to clarify and demonstrate local working partnerships and collaborations
- provide data describing the service provided, (numbers and types of patients, numbers of attendances, health and social outcomes etc).

The RCSLT has developed a range of resources to support its members with Continuing Professional Development. CPD is a regulatory requirement for all SLTs and this requires all HPC Registrants to demonstrate how the CPD they have undertaken has sought to enhance service delivery and to be of benefit to service users. The RCSLT has endorsed this requirement through its own CPD standards. http://www.rcslt.org/cpd/resources

THE EVIDENCE BASE

The commissioning and planning of services must be informed by the evidence base of effective practices.

This Resource Manual SLCN is based on a synthesis of existing published research. The threshold for inclusion in the syntheses has favoured the most scientifically robust research methodologies which have often reflected medical (impairment) rather than social (participative) models of care.

In the section summaries, emerging practices that have not been included in the evidence synthesis, are referred to and should be considered alongside the syntheses. This tension between empirical evidence resulting from robust research, which by definition is retrospective, and the needs to encourage innovation and service re-design to support improvements in outcomes for people with speech, language, communication and swallowing difficulties is natural and unavoidable. Emerging practice will not have the same evidence base and therefore less empirically stringent measures of evidence need to be taken into account for these areas including professional consensus and measures of service user, parent or carer experience. However, because of the value of some emerging innovative practice, they have been included in this resource.

An overview of the methodologies employed in identifying practices that are included in this resource accompanies this document.

Using these resources

Speech and language therapy managers can assist commissioners by understanding their agenda and the objectives that they are to be assessed on.

The Royal College of Speech and Language Therapists is providing these resources to assist speech and language therapists in gathering the core data required to support service tendering agreements, service planning, monitoring arrangements and/or where services require specification.

Each part of these resources is focused on a specific area.

The resources provide:

- *The Contextual Synthesis.* This includes definitions, information on the incidence and prevalence of the disorder, key contribution of speech and language therapists, consideration of the implications and broader consequences of the disorder.
- *The Synthesis of Key Literature.* This summarises the evidence of the impact of speech and language therapy.

Each section within these resources gives succinct information to inform the factual content for any service planning activity. These include:

- Key points
- Topic –What is [the condition]?
- How many people have [the condition]?

- What causes [the condition]?
- How does this condition affect individuals?
- What are the aims/objectives of speech and Language therapy interventions for [this condition]?
- What is the management for people with [this condition]?
- What is the evidence for Speech and language therapy interventions in [this condition]?
- Studies
- Assessment methods
- Speech and language therapy interventions
- Summary
- References

This information will need to be put into context, using local information.

Other guidance and resource materials

It is recognised that service managers may wish to amplify or clarify, an aspect of their service by providing reference to other national or local research of relevance.

The RCSLT has a range of resources which can be used to further support and inform the commissioning, planning and provision of services for people with speech, language, communication and swallowing needs. These can be found on the RCSLT website: www.rcslt.org

The RCSLT is grateful to the experts from within the SLT community who contributed to the evidence published in this document.

METHODOLOGY FOR SYNTHESIS OF LITERATURE

Introduction

The focus of the interventional synthesis within these briefings is to provide a synopsis on the effectiveness of speech and language therapy interventions for each specific condition.

The interventional syntheses are produced by reviewers within the Information Resources Section (within the Health Economic and Decision Science Section) at the School of Health and Related Research (ScHARR). Information specialists/reviewers for this bulletin were Diana Papaioannou and Anna Cantrell.

Methodology

The interventional syntheses are not intended to be a full systematic review within each topic area. However, they draw upon systematic review techniques to ensure that the syntheses are developed according to systematic, explicit and transparent methods. The intention of the syntheses is to consolidate twenty articles which represent some of the best research for each topic area.

Literature searching

Systematic literature searches were undertaken to identify a range of evidence for each interventional synthesis. The interventional syntheses do not attempt to consolidate all research within a particular topic area; rather they aim to present a careful selection of the most current research within that field. Therefore, the approach adopted for the literature search aims to be comprehensive reflecting this systematic and explicit approach.

Firstly, search terms were selected within the project team drawing on the expertise of four speech language professionals. This involved listing all possible synonyms describing the condition or population (for e.g. children/infant, stuttering/stammering) and combining those with terms to describe speech and language therapy. Terms were used in both free text and thesaurus searching. The following databases were used:

- ASSIA
- CINAHL
- The Cochrane Library (which includes the Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled trials, Database of Abstracts of Reviews of Effects, Health Technology Assessment Database and NHS Economic Evaluations Database).
- Linguistics and Language Behaviour Abstracts
- MEDLINE
- PsycInfo

All references retrieved from the literature searches were entered onto a Reference Manager Version 11 database using appropriate keywords.

Selecting and obtaining relevant articles

Articles for inclusion were selected to illustrate the range of good quality evidence within each topic area. An initial screening of articles was undertaken by the Information specialists/reviewers who adopted the following principles:

- Articles must be empirical research evaluating the effectiveness of a particular speech and language therapy intervention
- Only articles published in English language are included.
- In general, only the most current (1998-present) literature is included. However, exceptions were made to this if a particular article was felt to be important to include.
- Where possible higher level evidence was included (systematic reviews, randomised controlled trials). However, this research did not always exist in every topic area.
- Efforts were also made to seek out literature that provided a range of perspectives on interventions for each topic area, i.e. both quantitative and qualitative research.

Following initial screening, the remaining articles were examined by two members of the team; each having considerable speech and language therapy knowledge and experience. Approximately, twenty articles were selected by the two reviewers with disagreements being resolved by a third reviewer.

Assessing the quality of relevant articles

Formal quality assessment of the articles was not undertaken. Instead, quality assessment involved using checklists as a guide to give an indication of the overall quality of studies and highlight the main good and bad aspects of each study. For each interventional synthesis, the included study designs are listed and the problems with each study design noted. General observations on study quality are made and common errors within the studies, where appropriate, are specifically noted. The checklists used are one for quantitative and one for qualitative studies from the Alberta Heritage Foundation for Medical Research.1 Additionally, when an identifiable study design was used, the appropriate Critical Appraisal Skills Programme (CASP) checklist was selected.2

Syntheses of the twenty articles

Each article was read in turn by one of the Information Specialists/reviewers. The key points were summarised including the objective of the study, the participants' characteristics, the methodology, the intervention, results and limitations. From this, articles were grouped into themes according to the factor being investigated (for e.g., length of intervention, personnel carrying out intervention, family involvement in treatment, nature of disorder). Results were summarised and drawn together within each particular theme and a summary paragraph provided at the end.

These syntheses first went out for review by selected individuals, identified by the research team, with particular expertise in the delivery or management of services to the

[1] LM Kmet, RC Lee, LS Cook (2004) Standard Quality Assessment Criteria for Evaluating Primary Research Papers from a Variety of Fields. Accessed at http://www.ihe.ca/documents/hta/HTA-FR13.pdf (Accessed on 25th September 2008, now no longer available)
[2] Critical Appraisal Skills Programme (2007) Appraisal Tools. Accessed at http://www.phru.nhs.uk/Pages/PHD/resources.htm on 9th January 2009.

specific client group. Comments were included in the second draft, which was then dispatched to those selected by the Royal College Speech and Language Therapists who were invited to attend a focus group day. These therapists gave detailed consideration to their specialist area and contributed to the more general discussion of one further area. Issues to be captured in the key points were also identified within the focus groups. These comments contributed to the third draft of the syntheses, which again went out to reviewers. In some cases, further work was required in order to modify the wording and reflect discussion.

Checklist for service managers involved in commissioning services

Have you presented incidence and prevalence figures and local demographic trends for the conditions in your area?

Have you provided information on local access and use of services in the context of the number expected and highlighted your approaches to inequalities?

Have you consulted systematically with users to inform development of this commissioning proposal?

Does your proposal fit/link with local cross agency priorities?

Have you outlined the range of services provided including training?

Have you made clear how this fits with future planning for your service over the next 3-5 years?

Have you stated the assumptions which underpin your thinking in the plan and for future developments?

Have you offered predictions about the likely impact of investment in the proposal?

Have you made clear where the risks are and what contingency plans you have put in place?

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RCSLT RESOURCE MANUAL FOR COMMISSIONING AND PLANNING SERVICES FOR SLCN

Deafness

Deafness / Hard of Hearing Synthesis

1 Key points

1 Deafness / Hearing Impairment can have a profound impact on the development, education, employment opportunities and social life of the individual and their families. The risk of experiencing abuse is 3.4 times higher for a deaf child., 40% will experience mental health problems in childhood

2 There are specialist skills required for Speech and Language Therapists (SLTs) working with children and adults who are Deaf or Hard of Hearing. These specialist SLTs can directly manage individual cases or support local speech and language therapists in the continuing care of this client group

3 There is consensus that good practice demands that speech and language therapists are an integral part of the specialist team.

4 SLTs have key skills in promoting the development of speech, language and communication. They should play a central role in the support of children who are Deaf or Hard of Hearing and their families.

5 SLTs are experts in the differential diagnosis of speech, language and communication disorders and differentiate these from speech, language and communication difficulties associated with hearing loss / Deafness.

6 SLTs can facilitate families in making informed choices in the management of an infant, child, young person or adult with a hearing loss for example in decisions relating to communication by oral and/ or signed language.

7 SLTs develop listening and attention skills in individuals. This is of particular importance in babies diagnosed with significant hearing impairment, very young children and before and after Cochlear Implant if effective listening and spoken language skills are to be developed.

8 Research has indicated that the speech and language therapy interventions that have been studied are beneficial.

2 What is deafness/ hard of hearing?

Whilst the term hearing impairment is preferred by some, this synthesis uses this term along with the terms deaf and deafness to incorporate all levels of hearing difficulty in line with consumer organisations who have elected a range of terminology which does not imply severity of hearing loss.

Hearing impairment/deafness occurs when hearing is affected by a disease, disorder, or injury affecting the structure and function of the ear. The structure of the ear consists of three parts, the outer, middle and inner ear. The outer ear includes the pinna, ear canal and ear drum which collect the sound. The middle ear structure contains the ossicles and 3 inter-connected bones called the stapes, incus and malleus, these function by changing air conducted sound into vibrations that can be conducted by the bone, fluid and membranes of the human ear. The inner ear has the cochlea, a coiled, spiral tube containing hairs within

two fluid-filled chambers. These convert the vibrations into electrical impulses which the auditory nerve then transmits to the brain for interpretation.

The types of hearing impairment are considered to be as follows.

- *Conductive hearing loss***:** - a) The sound signal is diminished by a blockage that affects the sound passing from the outer to the inner ear. The blockage may be the result of a malformation or an accumulation of wax or fluid.
  b) Damage to the ossicles so sound is not transmitted to the inner ear.
  This type of hearing loss can usually be improved with medical or surgical treatment.

- *Sensorineural hearing loss***:** - This is associated with damage to the hair cells inside the cochlea, or the auditory nerve itself. Sensorineural hearing loss may be congenital, the result of aging or an injury. This type of hearing loss is permanent.

- *Auditory neuropathy spectrum disorder* (ANSD):- This is often referred to as auditory neuropathy (AN) or auditory dyssynchrony (AD): sounds are heard but not processed consistently; there are functional difficulties in analysis and use of information contained in audible signals. Speech perception that is affected in the early years may show improvement in the long –term.

Mixed hearing loss or deafness is associated with a co-morbidity of conductive hearing & sensorineural hearing impairment. Both these types of hearing loss may be congenital or acquired conditions.

Auditory processing difficulties (APD), and auditory neuropathy/ dyssynchrony (ANSD) affect how the sound heard by the individual is interpreted, the sound is heard as sound but not processed. APD tends to co-occur with other developmental conditions, such as, dyslexia, attention deficit disorder, autism, autism spectrum disorder, specific language impairment, pervasive developmental disorder, or developmental delay (see appropriate synthesis) (Wright et al 1997, Musiek & Chermack, 2007, Dawes & Bishop 2010, ASHA 2005). In contrast to APD, individuals with an ANSD demonstrate an abnormal or absent auditory brainstem response in association with intact otoacoustic emissions/cochlear functioning in association with a peripheral hearing loss as recorded on behavioural pure-tone audiometry (Downey et al 2009).

Hearing impairment is usually classed as mild, moderate or severe (RNID 2009, WHO 2010).

Table 1: World Health Organisation describes 4 grades of Hearing impairment (WHO 2010)

Grade of Hearing Impairment	Corresponding audiometric ISO value	Functional Performance
Mild/slight hearing loss	Hears at 25 to 39 decibels.	Hears/repeats words spoken in normal voice at 1 metre.
Moderate hearing loss	Hears at 40 to 69 decibels.	Hears/repeats words spoken in raised voice at 1 metre.
Severe hearing loss	Hears at 70 to 94 decibels	Hears some words when shouted into better ear.
Profound hearing loss	Hears at 95 decibels or more	Unable to hear/understand when voice is shouted.

Ross, Brackett and Maxon (1991) proposed a definition to describe types of hearing impairment. The term **'Functionally Hard of Hearing'** was used to refer to those who

understand and learn primarily by hearing and listening, albeit via amplification. A second term **'Functionally deaf'** was used to refer to those who understand and learn primarily through vision. These terms are now used less frequently in the clinical setting.

3 *How many people are deaf/hard of hearing?*

The Royal National Institute for Deaf People (RNID) estimates that in the UK there are almost nine million people with a hearing impairment resulting in a degree of deafness (RNID 2009). The prevalence of deafness varies with the age of the individual. The prevalence of a permanent hearing loss is 1 in 1,000 for new born children, and 2 in 1,000 for children aged 9-16. The difference in prevalence with age is related to later diagnosis, late onset or progressive hearing loss.

Table 2 Classification of hearing loss and prevalence by age group

Severity of hearing loss in decibels in better ear	Classification	Prevalence in population	Numbers in the UK
25db or worse	Mild/slight	16.1%	7.6 million
45db or worse	Moderate	4.9%	2.3 million
65db or worse	Severe	1%	0.5 million
85db or worse	Profound	0.4%	About 200,000

As stated, the prevalence of hearing impairment and deafness is associated with age and the following table estimates prevalence and severity in different age groups:

Table 3: Deaf and hard of hearing adults in the UK

Number	Age Group	Degree of Hearing Loss
8,945,000	*All ages*	*Hearing Loss*
2,474,000	16-60	Hearing Loss
6,471,000	Over 60	Hearing Loss
8,257,000	*All ages*	*Mild-Moderate Hearing Loss*
2,366,000	16-60	Mild-Moderate Hearing Loss
5,891,000	Over 60	Mild -Moderate Hearing Loss
688,000	*All ages*	*Severe-Profound Hearing Loss*
108,000	16-60	Severe-Profound Hearing Loss
580,000	Over 60	Severe-Profound Hearing Loss

The Royal National Institute for the Deaf reported that approximately 2 million people in the United Kingdom wear a hearing aid (RNID 2009).

As people age hearing deteriorates, a study by Davis et al (1990) found that those under 55 years were losing 3 dB each decade, after 55 years the rate was up to 9 dB/ decade.

Table 4: Age-related hearing loss (RNID 2009)

Age Group over 50 years	Age Group Over 70 years	Degree of Hearing Loss
41.7%	71.1%	Hearing Loss
21.6%	26.8%	Mild Hearing Loss
16.8%	36.8%	Moderate Loss
2.7%	6.3%	Severe Hearing Loss
0.6%	1.3%	Profound Hearing Loss

SLTs tend not to be involved in the management of those individuals with an age related deafness unless another communication problem co-exists or the individual has a Cochlear Implant (CI) (Fortnum et al 2002). Fortnum et al (2002) reported that almost 30% children with a hearing-impairment have a co-morbidity. Children who receive a cochlear implant are more likely to have a postnatal aetiology, and a lower incidence of co-existing learning or cognition difficulties than other profoundly deaf children (Fortnum et al 2002). As research on CI continues, so more children with complex needs are being offered CI.

Table 5: Incidence and Prevalence of Hearing Impairment

Incidence	Prevalence	Country
840 babies born annually in UK have a significant deafness (RNID 2009)	12,000 children aged 0-15 years born deaf. 1/1000 deaf at 3 years 20,000 aged 0-15 moderately to profoundly deaf (RNID 2009).	UK
1.1/1000 permanent bilateral hearing loss 0.6/1000 permanent unilateral hearing loss (Hall 2004).	0.2/1000 by 4-5 years 0.4-0.7 by 5-10 years 2.6/1000 for moderate, severe, profound deafness (Hall 2004, NDSC 2008).	UK
0.67⁄1000 severe to profound hearing loss (Downey et al 2009)	54/1000 bilateral, high-frequency, unilateral at school age (Bess et al 1998)	UK
	23,000 deaf blind people in the UK (RNID 2009)	UK
1.12 /1000 babies born with a congenital hearing loss (Fortnum & Davis 1997)	1.13/1000 deaf at 5 years (Fortnum & Davis 1997)	UK
1/2000 genetically caused congenital hearing loss (Frei et al 2004)		Austria

The incidence of ANSD appears to be higher in children who are born prematurely and who have had hyperbilirubinemia (Kirkim et al 2009, Dowley et al 2009).

Table 6: Incidence and Prevalence of Auditory Neuropathy & Auditory Dyssynchrony

Incidence	Prevalence	Country
24% of 54 children with bilateral HI>40dbhl from 44,000 (Sim et al 2009)		UK
0.27⁄1000 AN (Dowley et al. 2009) 40% of children with a severe/profound hearing loss (12/30) had AN (Downey et al 2009)		UK
	13.4% of 112 in severe to profound hearing loss 6-32 months (Sanyelbhaa et al. 2009)	Egypt
	15.38% of 65 children with AN/AD had hyperbilirubinemia. (Kirkim et al. 2008)	Turkey

4. What causes deafness/hard of hearing?

Many hearing losses are associated with a mixed aetiology, where the deafness is associated with a specific condition. The main causes of deafness/hearing impairment are listed below.

Genetic:
Genetic causes of hearing impairment/deafness are usually described as a Non-Syndromic hearing loss or a Syndromic hearing loss in association with other clinical findings. Dominant gene mutation occurs when only one copy of the gene is affected while a recessive gene mutation occurs when both copies of the gene are affected (Bitner-Glindzicz 2009). Some 75% of deafness has a genetic origin that is caused by the presence of a dominant or recessive gene. The gene Connexin 26 (abbreviated CX26) is estimated to be responsible for half of all the recessive cases of hearing loss. There is a higher risk of deafness in children where there is a positive family history of deafness in either parents or in a relative (Arnos et al 2008). The incidence of deafness is higher in cultures where inter-marriage of near relatives is more common (Wilcox 1999). Some 30% of causes of deafness are associated with specific syndromes such as Ushers syndrome or Pendreds syndrome.

Perinatal:
Deafness can have a congenital cause resulting from premature birth or birth conditions that affect the amount of oxygen the baby receives.

Infections:
Infections can affect both the structure and function of the ear, for example:-
- peri-natal infections, such as, rubella, toxoplasma or syphilis;
- anti-natal infections, such as, jaundice.

Diseases:
Certain diseases can cause a hearing loss, these include; Otosclerosis/ otospongiosis, Glue ear/Otitis media, Viral infections, Ménière's disease, Acoustic Neuroma, Meningitis, Encephalitis.

Acquired neurological conditions:
Acquired neurological conditions can lead to a central hearing impairment, dizziness or balance problems. These include Multiple Sclerosis, Stroke or Tumours.

Noise induced hearing loss/acoustic trauma:
Exposure to loud noises causes loss of hearing usually around 3000, 4000, or 6000 Hz. As noise damage continues the hearing loss spreads to lower and higher frequencies. Types of adverse activities include working with noisy equipment, such as pneumatic drills or gun fire, being in noisy environments such as clubs which play loud music or listening to music at a high volume through headphones (NHS 2009).

Trauma
Traumas such as head injuries or a blow to the head can cause sensori-neural or conductive hearing loss. A blow or a traumatic head injury can result in damage to the structures of the ear or auditory nerve pathway (RNID 2009). An explosion can shatter the ossicles in the middle ear, while poking a foreign object into the ear can damage the ear drum.

Age
Age-related hearing loss called 'Presbycusis' occurs when the sensitive hair cells inside the cochlea gradually become damaged or die (NHS 2009). This appears to be related to long

term exposure to the everyday noise experienced in Western countries as populations in areas of the world that are not exposed to everyday noise have a significantly lower incidence of presbycusis.

Side Effects of Other Treatments
Certain medicines or medical treatment can affect hearing. For example, treatments for cancer, Cytotoxic medication, can damage the cochlea or the auditory nerve and can lead to sensorineural hearing loss (NHS 2009). Likewise chemotherapy or radiation can affect hearing. Some powerful antibiotics can result in a permanent hearing loss and high doses of aspirin may cause temporary hearing loss and tinnitus (BUPA, 2009).

5. How does deafness/hard of hearing affect people?

Deafness can have an impact upon all aspects of an individual's life though reducing their ability to communicate and integrate with family, friends and the broader community. It can have a serious effect on education, employment and recreational activities (Austen 2004). An impact upon mental health is not unusual with increased prevalence of anxiety and depression in the deaf population. The impact on the individual and their ability to communicate is influenced by many factors including: the age of onset, age of identification of the loss, type of hearing loss, the configuration of the hearing loss, auditory discrimination abilities, environmental factors and the introduction, correct provision and consistent use of aids or cochlear implants. Family support is particularly important.

Language Development in Children
In order to develop speech and oral language, a child must be able to hear the speech sounds of their language. Speech/Language learning requires hearing of 30-60 decibels across frequencies of 250-8000 hertz and access to an adequate acoustic environment (e.g. ideal signal to noise ratio). Hearing-impairment in infancy or early childhood impacts on speech, language, reading and writing skills and the child's ability to access education and achieve academically (Davis 1990). It affects the development of understanding, expression, vocabulary and grammar and reduces speech intelligibility. These difficulties impact on reading, writing and on interaction with others and causes difficulties in accessing the National Curriculum (Law et al 2000, Dockrell & Messer 1999). Children have a developing linguistic system so they are less able to use context to understand in situations where the auditory signal is compromised. Therefore, children need better acoustic environments than adults do, and better acoustic environments in education for good language and learning outcomes. Different environments influence hearing, with background noise affecting the ability to perceive and to interpret what is heard as is the ability to hear intelligible speech over distances. This impacts on the child's performance in social, education and work environments. If the level of hearing impairment affects functional communication, then behavioural problems may arise (Glickman, 2009, Austen & Jeffery 2008).

A number of studies into brain development have indicated that the sensory stimulation of the brain's auditory centres is important to its development and organization and to the building of auditory pathways (Boothroyd, 1997, Chermack and Musiek, 1997, Musiek and Berge, 1998). Sound processing preferences change with age, studies have reported stronger auditory processing in infants and children, with visual channels stronger in adults. During childhood children are predisposed to using auditory cues (Napolitano & Sloutsky, 2004,) and associating speech-reading with lip movements from an early age (Woodhouse et al 2009). The negative effects of hearing-impairment in children can be mitigated by early detection of hearing loss through hearing screening and intervention using amplification or cochlear implants. The use of newborn screening, early amplification and intervention have been shown to help language development (Wolff et al., 2010) as children benefit from being

taught to use their auditory skills to develop language (Zupan & Sussman 2009, Hogan et al 2008).

As stated, the presence of a hearing-impairment affects how the child develops. Hearing impairment can impact on each of the aspects highlighted in Every Child Matters (DoH 2008). The five outcomes were: be healthy, stay safe, enjoy and achieve, make a positive contribution, achieve economic well-being. The hearing-impaired child is at risk on each of these points and the child may have long term difficulties with the development of speech, language and communication skills (Eadie 2004).

Table7:International Classification of Functioning- ICF (WHO) areas at risk of being affected by deafness

ICF Dimension	Areas at risk affected by hearing impairment
Impairment	Auditory discrimination skills Language skills Auditory comprehension Speech skills Verbal expression Communication Pragmatic skills Mental Health issues
Activity	Using intelligible speech Communicating Learning in a hearing environment Listening if there is background noise Interacting appropriately with peer communication
Participation	Integration Problems coping in certain social situations Problems establishing peer relationships Social isolation Social participation Problems with education and employment Contributing to society
Well-being	Depression Frustration Loss of confidence Anxiety Sadness Challenging behaviour Anger management

6 What are the aims and objectives of Speech and Language Therapy for individuals with deafness/ hard of hearing?

The Speech and Language Therapist role with hearing impaired individuals will vary as this is a heterogeneous population. Intervention will depend on whether the child/family chooses to follow a specific communication route, oral or signing or both (Kumar et al. 2009). SLTs need to provide support to the family in making an informed choice on mode of communication.

Aims and objectives of Speech and Language Therapy for individuals with deafness differ according to type of deafness and the age of the individual. SLTs need to ascertain the type

and degree of deafness depending on whether it is a permanent or temporary congenital deafness or an acquired deafness of sudden or progressive onset (RCSLT 2006). Consideration will also be given to any diagnosis additional to hearing impairment when giving advice to parents and when choosing a therapy approach and mode of communication. If amplification is used, then the type of amplification used will influence speech/language acquisition and use. Therefore, the SLT needs to ascertain the individual's auditory perception, and ability to understand and communicate when both aided and unaided in closed-set tests or functional listening in everyday situations so the benefit of the listening device can be ascertained. Assessments may include an audio-visual digital recording to allow assessment of non-verbal communication (RCSLT 2006) and may be completed aided and unaided.

SLT assessment/intervention includes:

- Ascertaining the deaf individual's speech/language and pragmatic abilities through assessment, observation and report.
- Assessing the person's speech perception skills and analysis of whether these correspond to what would be anticipated from their Audiograms (aided and unaided) and profile of hearing loss (e.g. age of onset & whether pre- or post-lingual, duration of deafness, consistency of hearing aid / cochlear implant use).
- Determination of vocal characteristics, phonetic accuracy, pitch, range, quality, resonance and volume.
- Appraisal of communication abilities, including the method employed to communicate through oral and/or signing in different environments.
- Review of the client's use and understanding of gesture, facial expression, social communicative behaviour and discourse skills in relation to both spoken and sign languages.
- Assessment of speech-reading skills for single words and discourse.
- Measurement of intelligibility of speech in different environments.
- Providing detailed and accurate assessment reports.
- Investigating factors relating to the individual's quality of life, taking into account the individual's needs, preferences, and beliefs.
- Working within a multidisciplinary team to help the individual reach their potential.
- Providing appropriate treatment programmes and ongoing support.

Children

SLTs are aware of the impact of hearing on sound acquisition, language development and intelligibility of speech and are skilled in assessing the speech and language abilities of children. Hearing is important to the development of speech and language. The ability to hear, listen and attend develops before birth and during the early years of development.

SLTs have the understanding of speech/language development to enable them to assess the child's developmental progress and identify areas of difficulty in speech/language acquisition. SLTs will use their knowledge of speech, language, communication and audiology to assess the child and develop an appropriate care package. SLTs will work in partnership with the child, parents, family and involved professionals to reinforce the learning process. Auditory training can promote development of auditory centres in the brain and facilitate auditory processing and speech/language development (Russo et al. 2005).

Early identification of hearing impairment is essential so that correct amplification can be fitted as early as possible. Family involvement is essential to provide the communicative environment for the child to develop the sound detection and listening skills necessary to achieve speech and language.

Deafness is often associated with other developmental disorders and thus precise identification of the underlying communication abilities and the contribution of the hearing impairment to this are essential to ensure that appropriate advice and treatment are given.

The particular needs of working with hearing-impaired children require SLTs to have undertaken specialist post graduate training. Where appropriate, these specialist SLTs will work closely with the specialist teachers of the deaf (ToD) and psychologists. In order to work effectively together, each profession will be aware of the knowledge and skills of each other's professional input to hearing-impaired children and have an understanding of the structure and delivery of individual services so that these can be provided in a complementary and mutually supportive manner.

Aims

SLTs will work with families and other specialist members of the hearing/deafness team. SLTs will aim to:-

- to teach speech and language.
- facilitate communication development through advice and specific programmes of intervention as appropriate.
- contribute to the development of communication strategies ensure that the work of SLTs is integrated with local education policies (LEA).

Objectives

- Complete informal and formal assessments of communication skills in co-operation with parents/carers, education staff and other involved professionals.
- Ascertain current level of speech and language functioning.
- Inform relevant parties on pertinent information gained from assessments.
- Work with the family and care team to make informed choice on method of communication (oral, signed, mixed, AAC).
- Work with relevant parties on communication (e.g. auditory discrimination, listening, speech and language work, pragmatic understanding).
- To contribute to full assessments, reassessments and reviews of statements of Special Educational Needs (England and Wales) and Additional Support Needs (Scotland).
- To liaise with appropriate agencies and attend case conferences and other meetings.
- To provide training through individual, group and workshop sessions for parents, family and education staff on topics related to speech, language and communication.
- To contribute to planning the school day for children and liaise with education staff on communication development and support.
- To support parents / carers of babies following newborn hearing screening programme diagnosis to ensure that communication development is not interrupted by the diagnosis and grief that ensues. Parents / carers require ongoing support to understand the diagnosis and its implications and to maximize opportunities to develop their infant's communication. Early detection can be detrimental unless it is followed by early intervention.

SLT intervention will include integrating specific visual and auditory activities; such as auditory training, phonological awareness skills, speech processing, phomeme-grapheme associations, speech reading, gesture, listening activities (sounds) and activities to promote parent and child interaction. They will encourage language stimulation activities and provide therapy to improve intelligibility. In the case of very young babies diagnosed with significant hearing loss (often through newborn hearing screening programmes), SLTs make a vital contribution to intervention using a developmental approach where parental involvement is integral.

Table 4: Examples of some intervention approaches in SLT Intervention in children

	Age	Purpose
Pre-school	Infants to 2 years	Assess, advise and provide intervention and training as required to promote hearing, listening, attention to sound. Integration with visual stimuli including gesture. Assess, advise and provide intervention and training as required to enhance language development (sign/oral) and intelligibility. Social interaction and play development Provide intervention based on the principles of auditory-verbal therapy. SLT may provide input to young children perceived to be at risk (e.g. auditory awareness programme). Educating/training parents/carers. Training relevant staffs. Hanen program with parents. Advice on transition to nursery. Reinforce work of ToD and audiological team. Contribute to Cochlear Implant team.
School	3-4 years	Assessment, advice and training on sounds/phonology development. Differential diagnoses. Advice on speech-reading. Advice on attention and listening skills. Phonological awareness. Phonological processing (input/output). Sound production. Core Vocabulary. Social interaction skills. Assessment and development of verbal and /or signed expressive language skills, verbal and/or sign comprehension skills, social communication skills. Advice on transition to school. Reinforce work of ToD and audiological team.
School age	5-11 years	Assessment, advice and training on sounds/phonology development. Phonological awareness. Phonological processing (input/output). Sound production. Literacy skills. Core Vocabulary. Assessment and development of verbal and /or signed expressive language skills, verbal and/or sign comprehension skills, social communication skills. Assessment of functional listening and comparison to expectations from audiogram. Differential diagnoses. Assessment of contribution of speech reading skills to verbal comprehension. Advice on transition. Reinforce work of ToD and audiological team. Counselling and support

Auditory Verbal Therapy
Auditory Verbal Therapy (AVT) is an approach that focuses on supporting parents as the key people for developing a child's spoken language through listening (Hogan et al. 2008). The aim of AVT is to help children with a hearing impairment to learn to listen through a number of strategies. An important aspect is teaching the child to detect and respond to voice. Children who participate in the AVT programme have a permanent hearing impairment, use hearing aids and/or cochlear implants, and are seen early from 3 months of age. SLTs need to be specialist trained to work as an AVT SLT (AVT accessed May 2010).

Cochlear Implants
Auditory development requires conductive and sensori-neural hearing ability as well as the ability to process and interpret auditory information perceived centrally. As stated, children born with a sensori-neural hearing loss are at risk of not laying down appropriate neural pathways for sound perception and interpretation due to deprivation of the auditory sense. Cochlear implants (CI) can help neural pathways to develop if fitted at an early age (Gordon et al 2003) and are suitable for children with more significant degrees of hearing loss who cannot perceive the speech spectrum through the standard amplification provided by acoustic hearing aids. Recipients of CI can have conductive hearing impairment but this difficulty is bypassed as the electrodes from the CI sit inside the cochlear and stimulate the auditory nerve directly. SLTs work within and outwith cochlear implant teams to contribute to the assessment and management process of individuals with cochlear implants. Their role is to facilitate the ability to listen to and perceive speech sounds and develop communication skills post implantation. Most work is with children because of the importance of early, effective sound perception in speech and language development (Geers et al. 2002, Bond et al. 2008). SLTs also work with some adults who have cochlear implants to develop listening skills and to promote the return of functional speech and communication skills.

Adults
SLTs work with adults with hearing-loss who will benefit from intervention to promote listening skills and speech-reading. Cochlear Implant teams for adults usually include a SLT in the rehabilitation programme who will develop listening and communication skills.

Table 8: International Classification of Functioning- ICF (WHO) dimension: SLT intervention aims to improve or maintain skills

ICF dimension	Techniques to improve or maintain
Impairment	Speech skills Language skills Attention skills Listening skills Pragmatic skills Insight
Activity	Ability to understand and express Ability to communicate Ability to use discourse Ability to enjoy talking in different settings Ability to use assistive/augmentative communication Ability to control behaviour in different settings
Participation	Ability to integrate socially Ability to participate socially Ability to use social and interaction skills Ability to have self-esteem as a communicator Ability to have autonomy Ability to behave appropriately in different settings
Well-being	Advise on strategies to reduce anxiety, frustration and upset Advise on situational awareness to reduce stressors

7. What is the management for individuals with a deafness/hard of hearing?

The education, training and experience of speech and language therapists gives them unique skills in the area of phonetics, linguistics, phonology, language development and communication skills. Thus they can contribute to the team supporting the family and intervening with the child and, where appropriate, the adult.

Children

The SLT's skills are required to accurately monitor the speech and language development of a child, their progress and response to treatment. The SLT is key to ensuring that the communication impairment is appropriately and precisely diagnosed. The SLT will work with the family to help the parents to make an informed choice on their chosen method of communication.

SLTs work with families and very young babies to provide guidance and training in techniques which promote communication. This includes the development of auditory skills, promoting communication strategies and helping families to integrate the child with a hearing impairment within their family. The care pathway for each child will be tailored to their particular needs taking account of their environment, diagnosis, preferences of the family and other support available. The information may be recorded in a 'family plan' so the family are aware of who are providing support to them. Recent research studies emphasised the importance of family involvement in language development training, including Auditory Verbal Therapy (AVT) which emphasises the need to equip parents with appropriate skills and knowledge in order to facilitate the skills needed to promote development in their children. (See section 8) SLTs will have regular liaison with other team members, particularly local ToDs, and Audiologists to coordinate intervention. The SLTs will contribute to regular reports which will provide information on the audiological profile, use of hearing and hearing aids, communication skills including speech and language, general development and parental views (Cheshire & Merseyside Permanent Speech and Language Therapy Hearing Impairment Network 2010). Different strategies may be used according to the particular needs and preferences of the deaf child and their family. These may include promoting the development of spoken language through listening as in Auditory Verbal Therapy, total communication, compensatory techniques and developing oral skills. Other areas of intervention may include treatment of attention, memory, processing as well as phonological processing and production.

Cochlear Implants

Specialist SLTs play an important role contributing to assessments made with the Ear Nose & Throat (ENT) and Audiological sections of the cochlear implant team. SLTs contribute to the assessment, decision-making care and support provided to the deaf child/adult and their family. This specialist SLT also liaises with the local teams to ensure integrated care. Children need intensive support focused on developing their auditory skills in order to help them to develop an identity as a 'listener' / member of the 'hearing' world and to integrate understanding and use of audition into their communication skills. Parents need support to ensure they can provide their children with access to a lot of meaningful, enjoyable auditory experiences in everyday contexts as well as more structured settings. Children need support to help them to maximise use of their residual hearing (however limited) prior to implantation, to gain full benefit from the device post implantation. This can be a stressful time for children and their families and their relationship with the therapist can be supportive. The therapist can play an intermediary role in the team explaining the requirements to the family and the family's concerns to other members of the team.

Adults

Adults with hearing impairment can benefit from auditory training to improve speech perception and evoked potentials show changes in cortical functioning as a result of training

(Tremblay et al., 2002, Sweetow et al., 2005, Gil & Iorio, 2010). The therapist can explore, counsel and support the individual in coming to terms with their hearing impairment and in introducing strategies to improve their quality of life.

Cochlear Implants
Adults are seen intensively by the specialist SLT following cochlear implantation or when diagnosed as deaf. The objective of the intervention is to enhance sound interpretation, sound awareness and to increase communication skills.

Children and Adults

Certain interventions provided by the SLT have been found to be effective, these are reported in section 8 of this synthesis.

At certain points of transition in the individual's life there are often critical points for the SLTs to intervene. Transition points may include starting school, changing class, moving school, entering college or employment and other significant life events. What is important is that the individual and their family have access to specialist SLT support at those points in their lives that require support because of change in either abilities or circumstances.

Table 9: SLT as a member of different teams may include the following

Age Group	Teams
0 to 2 years 3 to 4years 5 to 18 years	Family/carers, Health Visitor and Health Team and the specialist doctors including ENT Specialists, cochlear implant team, paediatricians, audiological physicians, audiologists, clinical and educational psychologists, nursery staff, teachers, teachers of the deaf, special needs teachers, social services team, voluntary and independent sectors, local authority.
19 year upwards	• Family & Carers • ENT specialists • cochlear implant team • Audiological Physician • Health specialists (e.g. neurologists) • Audiologists • Clinical Psychologists • Hearing Therapists • Higher Education providers • Specialist employment services • Voluntary and independent sectors • Criminal justice system • Employers and business/commerce

Augmented and Alternative Communication

Augmentative and alternative communication systems are used with individuals to facilitate communication (Davis et al 2010). This may take the form of amplification. Hearing aids can be very effective in aiding hearing, particularly in providing early amplification for children. Cochlear Implants, provided at an early age or soon after the onset of acquired hearing loss, help development of hearing and of listening skills and promote brain development for audition and spoken language (Kril et al. 2006, Falcon 2007).

Sign language is used effectively by many in the deaf community to communicate. It enables children to develop language and communicate with others who understand sign language. Parents who sign are very effective at developing language skills in their children

through providing a signing environment. Most infants with significant hearing loss are born to families who are not Deaf and do not have sign language. If parents, who do not know sign language, choose this communication mode for their child, there needs to be provision for the parents and extended family to learn to sign fluently themselves to ensure the child's signing development is not impoverished.

High tech AAC systems can also be used to produce speech to facilitate communication with those who do not understand signing. It can relieve frustration and help to reduce anxiety in social situations. SLTs can advise on AAC usage as a component of the interventions offered.

SLTs may require the services of interpreters for the deaf (British Sign Language).

Cultural diversity

SLTs are aware of the unique needs of deaf children from multi-lingual backgrounds (spoken, sign language, language of the home). Individuals who use English as their second language and are deaf may, along with their families, need help to access services. An interpreter may be required to assist with conducting the SLT assessment to ensure it is both accurate and reliable and to facilitate understanding of therapy and implementation of treatment strategies. This interpreter may need to both understand and use sign language. There are time and cost implications when working with signing interpreters/co-workers for example, in taking a case history, completing a full assessment in all languages spoken by the individual and their family. SLTs working with people who are deaf need to be aware of cultural and religious factors which may impact on ability to access services, e.g. timings of services need to be culturally sensitive, for example, not offering appointment times which coincide with religious observations (Communicating Quality 3 2006).

8. *What is the evidence for SLT interventions for individuals with deafness/ hard of hearing?*

Details of studies

Eighteen studies were included in the assessment of SLT interventions for hearing impairment. Eight studies focussed on language development and ten studies focussed on improvements in speech production although some studies assessed elements of both. The types of interventions fell into two broad categories. Six studies evaluated longer term therapeutic programmes, including auditory-verbal therapy programmes and the role of family involvement. The remaining twelve studies evaluated shorter term training interventions, including various computer software programmes, aimed at targeted and clearly specified improvements in speech and language, particularly speech production.

All eighteen studies were published in English. Nine studies were undertaken in the USA, three in Australia, three in Canada and three in the United Kingdom. The earliest studies were published in 2000 and the most recent were published in 2008. All studies were small with study populations ranging from a single case study to a case controlled sample of 58 participants. All participants with hearing impairments were children. Where adults formed part of the study population it was in their role as parents of children with hearing impairments. Children ranged from 2-3 years to 15 years old. Most studies included preschool to pre-adolescent populations.

The majority of studies included children with a range of hearing loss severity and a range of hearing devices (hearing aids and cochlear implants). Whilst several studies included all

users of hearing aids or all users of cochlear implants, the choice of study population in most studies appeared to be based on a pragmatic selection.

Study quality

No randomized controlled trials were identified and overall study quality was poor in terms of sample size and lack of comparators or controls. One study was a single case study. Seven were multiple case studies consisting of several within subject evaluations. Eight studies were small, uncontrolled, non-comparative observational cohort studies. One further observational study used a cross-over study design and the remaining case control study, which was the highest quality study, included normal hearing children, matched for language ability, as a control group.

Many studies used recognised and validated instruments to measure outcomes. Most studies measured outcomes before and after the intervention and some used repeated measures during the study. Some studies used blinded assessment of outcomes.

Most studies acknowledged the difficulties of evaluating interventions with hearing impaired populations. Specifically studies discussed the range of variables which could affect and/or confound treatment effects. These included severity and age of onset of hearing loss, type of hearing device, experience of using a hearing device and language and cognitive ability. It also included variation in the delivery of complex interventions. Some studies attempted to assess the impact of variables on study results.

Speech and language interventions

Of the six studies that considered longer term interventions three studies evaluated auditory-verbal therapy (AVT) programmes (Dornan, D. et al. 2007;Hogan, S. et al. 2008;Rhoades, E. A. et al. 2001), one study evaluated a parents' (Hanen) training programme (Paganga, S. et al. 2001) and two studies considered the effect of maternal involvement in early intervention (DesJardin, J. L. 2006;DesJardin, J. L. et al. 2007).

Of the twelve studies evaluating shorter term, more focussed interventions, three studies assessed a number of training techniques delivered by therapists. (Bow, C. P. et al. 2004;Justice, E. C. et al. 2008;Paatsch, L. E. et al. 2001). Nine studies used computer software packages to develop speech and language abilities. One study used computerised exercises in game format to develop language skills. (Schopmeyer, B. et al. 2000). The remaining eight studies used computerised imaging to provide visual feedback on speech production. (Bacsfalvi, P. et al. 2007;Bernhardt, B. et al. 2005;Bernhardt, B. et al. 2003;Clendon, S. et al. 2003;Ertmer, D. J. et al. 2000;Massaro, D. W. et al. 2004a;Massaro, D. W. et al. 2004b;Pratt, S. R. 2003).

Auditory-verbal therapy programmes

AVT programmes are based on the assumption that hearing and listening are the most effective channels for teaching language skills. AVT seeks to focus on developing spoken language skills through listening, in order to restore the balance between the senses. This is in contrast to other approaches that focus on using vision, the 'stronger' sense to compensate for audition, the 'weaker' sense (or those approaches that integrate both in therapy). Families' involvement in children's language development is regarded as essential in AVT.

Two of the three studies assessing AVT were longitudinal cohort studies of children enrolled on AVT programmes. (Hogan, S. et al. 2008;Rhoades, E. A. et al. 2001) Language abilities were assessed as children enrolled on the programme and were tested at regular intervals

until children left the programme (from 1 – 5 years of enrolment). The third study was a 9 month case control study (Dornan, D. et al. 2007) which compared the language development of children with hearing impairment with normal hearing children matched for language ability.

All three studies used at least one standardized speech and language test to assess receptive-expressive language development. In addition to comparisons with baseline scores the study by Dornan and colleagues compared development with that of controls and the study by Hogan and colleagues modelled predicted language development scores in the absence of intervention and compared these with actual development.

All three studies observed improvements in language development. In the Dornan study, no significant difference was seen in progress made by children with hearing loss compared with normal hearing controls. Both the Hogan and Rhoades studies observed improvements exceeding what would be expected of children with hearing impairments.

Notwithstanding weaknesses in terms of study design, all three studies discussed a large number of factors that could have had an effect on language development and acknowledged the potential impact of not controlling for these variables. The study by Hogan and colleagues subjected results to sensitivity analysis and concluded that positive changes in language development might be seen for a number of reasons not connected with AVT.

Parental involvement studies

All studies that considered the importance of family involvement in language development training, including AVT studies, discussed the need to equip parents with appropriate skills and knowledge in order to facilitate the skills development of their children.

An observational study by Paganga (Paganga, S. et al. 2001) evaluated a parents' training programme, the Hanen training course. Three examples of the course, involving a total of 18 parents whose children used cochlear implants, were evaluated. The course consisted of group training sessions and individual sessions where parent-child interaction was videotaped and reflected upon in order to develop conversational strategies. Video samples from the first and final sessions were used to evaluate the course in terms of improvement in parent-child interaction as rated by naïve raters using a published 5 point scale. Video samples were presented for evaluation in random order at the end of the intervention phase.

Significant improvements were reported with interaction ratings moving from 'not very effective' to 'quite effective' by the end of the study. The impact on results of parental motivation, which was considered as high in the context of a study environment was discussed. Conversely, it was considered that the use of naïve raters who judged the evaluation task as difficult, leading to a tendency to choose less extreme ratings, may have led to an underestimation of effectiveness.

Two studies, one of children using hearing devices, the other of children using cochlear implants, used a similar observational study design and study procedures, to assess the effectiveness of the role of mothers in their children's language development. (DesJardin, J. L. 2006;DesJardin, J. L. et al. 2007)

In each study 32 mothers completed a self-rating questionnaire to assess their perceived self-efficacy and level of involvement in activities relating to their children's language development. Mother-child interactions were videotaped and the mothers' utterances were scored on a scale of facilitative language techniques. Higher level language techniques included parallel talk and open-ended questions. Lower level techniques included closed questions and directive instructions. Analysis was undertaken to explore two possible

relationships. First whether there was a relationship between the mothers' questionnaire ratings and their use of facilitative language techniques and second, whether there was a relationship between the level of facilitative language technique used and children's receptive and expressive language skills.

Self-efficacy beliefs and involvement were reported as being associated with higher level facilitative language techniques. In turn higher level techniques tended to be associated with more advanced development in children's language skills. Results were similar in both studies. Limitations of the studies were discussed including the relatively high socio-economic status of mothers included in the studies and the validity of the self-rating questionnaire.

Therapist-based speech and language training techniques

Bow and colleagues evaluated the effectiveness of phonological and morphological training in terms of speech perception, grammatical judgments and speech production. (Bow, C. P. et al. 2004) The rationale underlying the study was the close relationship between levels of ability in hearing, language and speech production and the difficulties in establishing whether specific speech problems can be attributed to production errors or morphological errors.

The study used a non-randomised cross-over design involving 17 subjects. Training was undertaken using games, stories and worksheets. Group 1 was assigned 9 weeks of phonological training followed by 9 weeks of morphological training. The procedure was reversed for Group 2. Phonological training focussed on the production of consonants /s,z,t,d/ at the ends of words. Morphological training focussed on simple past tense and plurality.

Assessments of speech perception, grammatical judgments and speech production using a range of tests were undertaken pre-training and at the end of both training periods.

Significant improvements in grammatical judgments were observed following either type of training. Significant improvements in speech perception were observed but only after both types of training had been undertaken. No significant improvements in speech production in either trained or untrained phonemes were observed.

Using similar training activities, Paatsch and Blarney assessed the effectiveness of phonetic and phonological training on speech production of trained and untrained consonants in twelve children. (Paatsch, L. E. et al. 2001) All children received both types of training. Based on pre-intervention evaluation, phonemes that were produced correctly less than 40% of the time (Category 1 phonemes) were assigned to phonetic training. Phonemes that scored 40-70% correctness (Category 2 phonemes) were assigned to phonological training.

Training was evaluated in terms of phonetic level evaluation (Ling), word tests (SWAT) and conversational samples (CASALA).

Improvements were observed in trained phonemes following both phonetic and phonological training. These improvements were generalized to improvements in untrained phonemes. Greater improvements were seen in category 2 phonemes (i.e. those subjected to phonological training) although this result is confounded by the difference in the pre-intervention articulation level. The study concluded that improvements may have been due to the effects of systematic training over time rather than specific training approaches.

A multiple case study involving three subjects using cochlear implants assessed the effectiveness of a production-based narrative-based language intervention (NBLI). (Justice,

E. C. et al. 2008) The intervention targeted grammatical goals embedded in story retelling and story generation narrative techniques.

The intervention was evaluated by assessing participants' narrative technique using 'quick narrative assessment' and conversational techniques using 'SALT'. Two out of three participants were reported as making noticeable improvements by the end of the study and at three months follow-up. Experience in cochlear implant use and family involvement in language development were cited as variables possibly affecting results associated with each participant.

Computer-based speech and language training techniques

All computer-based interventions with the exception of one study (Schopmeyer, B. et al. 2000) involved the use of visual feedback to support speech production.

The Schopmeyer study assessed the use of an auditory training software package Fast ForWord™ in the development of language skills of 11 children. The programme consisted of 7 exercises in game format in which subjects registered their responses to auditory tasks.

Evaluation of receptive-expressive language skills was undertaken using a range of standardized tests.

All subjects were reported as showing significant improvements on all tests after 8 weeks of training. It was acknowledged that further follow-up was required to assess effectiveness in terms of the long term language learning curve of children.

Three studies by the same research group, using a similar design and similar procedures, evaluated the use of electropalatography (EPG) and ultrasound to provide visual feedback in vowel and consonant speech production training. (Bacsfalvi, P. et al. 2007;Bernhardt, B. et al. 2005;Bernhardt, B. et al. 2003) All studies were multiple case studies, with the same adolescents participating in all three studies. Four subjects participated in the earlier studies and three subjects from the same group participated in the later study.

Electropalatography and ultrasound provided computerised images of vowel and consonant phonemes elicited from the participants' reading of sentences. All participants received both types of imaging. As part of the feedback and as part of the evaluation, images were compared with age-matched reference data from local hearing adults. Speech recordings, taken pre- and post-intervention were transcribed and rated on a three point scale.

In the earliest study (Bernhardt, B. et al. 2003), which focussed on targeted vowels and consonants, recordings were rated by trained listeners. Given that the ultimate measure of effectiveness should be understanding by untrained listeners the second study (Bernhardt, B. et al. 2005) analysed the same data, evaluated on the same three point scale by untrained listeners. The most recent study (Bacsfalvi, P. et al. 2007) focussed on targeted vowels only. It is probable that evaluation was undertaken by trained listeners although this isn't stated explicitly.

In the earliest study (Bernhardt, B. et al. 2003) participants overall were reported as making significant improvements in speech production. Gains in treated targets compared with untreated targets were significantly different, although some generalization to phonetically similar consonants was observed. The results were not dependent on a particular technology with both EPG and ultrasound resulting in similar benefits. In the second study (Bernhardt, B. et al. 2005) general congruence between the trained listener and untrained listener evaluations was observed. It was suggested that in some cases untrained listeners evaluated more highly due to greater tolerance of inaccuracies in pronunciation. This

possible overestimation of effectiveness contradicts the use of untrained evaluators in the Hanen training course study discussed earlier. (Paganga, S. et al. 2001) In the remaining EPG study (Bacsfalvi, P. et al. 2007) some short term impact on vowel production was observed with 8 out of 15 vowels showing gains. However improvements were not consistent across evaluation methods and it was not possible to ascertain whether improvements were temporary or stable.

All studies discussed factors relating to the generalisibility of results including the extent to which the participants found the training task tedious and the maintenance of improvements once training was discontinued.

A multiple case study by Ertmer and Maki (Ertmer, D. J. et al. 2000) compared training using real time computerized displays of speech with training without computerized displays of speech. Four participants received training in targeted consonant sounds with spectrographic displays (SDs) and with noninstrumental (NI) instruction.

Speech production was evaluated in terms of establishing, maintaining and generalizing consonant sounds. Evaluation of baseline and post-training production, presented in random order, was undertaken by listener-raters. Further evaluation was undertaken at 2 and 6 weeks follow up.

Improvement in speech production of trained consonants was seen in all subjects. No difference between SDs and NI was observed. All subjects demonstrated generalization to untrained consonants to varying degrees. Generalization results for SDs and NI were mixed as were results for maintenance at 2 and 6 weeks.

Two multiple case studies by Massaro and Light (Massaro, D. W. et al. 2004a;Massaro, D. W. et al. 2004b) evaluated the use of Baldi®, a computer-animated talking head, as a language tutor for speech production and for learning new vocabulary. As well as acting as trainer and evaluator, the transparent talking head provided 3D visual feedback, similar in principle to electropalatography.

In the first study (Massaro, D. W. et al. 2004a) seven subjects undertook articulatory training on targeted phonemes. Intelligibility ratings of pre- and post-test productions were undertaken by blinded assessors. Significant improvements in post-test productions were reported both across and within subjects. Production of untrained words also improved significantly suggesting generalization. Ratings of production at six weeks follow-up were significantly lower suggesting that improvements were not maintained.

In the second study (Massaro, D. W. et al. 2004b) eight subjects underwent training on new vocabulary items. Training involved imitation (copying Baldi®) and elicitation (providing the correct word when a picture item was shown). Evaluation was in terms of accuracy of elicitation. Consistent improvements were seen for all subjects and these were maintained at 4 weeks follow up. Though not measured formally evaluators noted that pronunciation improved with learning but this improvement was not maintained at follow up.

Two studies evaluated the computer-based visual feedback speech production training package SpeechViewer. (Clendon, S. et al. 2003;Pratt, S. R. 2003) The study by Pratt, a single case study of a 13 year old subject, treated consonant voicing inconsistency using the SpeechViewer II. In the study by Clendon and colleagues SpeechViewer III was used together with Earobics, a training software package aimed at improving phonological awareness skills. The Clendon study included five children who all used cochlear implants.

The case study (Pratt, S. R. 2003) used multiple baseline measurements. Evaluation post-training was undertaken by a clinician and independent listeners. Analysis was reviewed by

3 further independent judges. Significant improvement in post-training consonant vowel (CV) sounds was reported. Generalization to untrained sounds was also significant. Improved intelligibility in terms of connected speech was limited.

Pre-, mid- and post-training evaluation in the Clendon study assessed speech production, language perception, hearing and reading. Significant improvements in post-intervention speech production, language perception and phonological awareness were reported. Reading and speech perception were reported as being not significant. It was not possible to say which intervention was responsible for which improvements. The authors discussed concerns relating to software performance and the inability of the software to sustain participants' attention.

Conclusion

All studies included in the review reported benefits associated with the interventions under evaluation. Very few studies provided comparative evidence other than baseline and post-intervention outcome measures. None of the studies were able to comment on the long term impact of interventions. In studies that considered more than one intervention some specified that it was not possible to ascertain which improvements were associated with which intervention. Furthermore many studies acknowledged that positive results could be confounded by what amounted to a large number of factors. This is likely given the size of included studies, the heterogeneity of study populations and the complexity of interventions under consideration. At best this suggests that some form of systematic speech and language intervention appears to be beneficial at least in the short term in populations with hearing impairments. At worst the benefits reported in the studies could be associated with factors other than the interventions under evaluation.

Table 10: Evidence on SLT interventions for hearing impairment

Study	Country	Study design	Subjects	Intervention
Bacsfalvi P, 2007 (Bacsfalvi, P., Bernhardt, B. M., & Gick, B. 2007)	Canada	Multiple case studies	Three subjects Adolescent (18 years) 2 male, 1 female Severe to profound sensorineural hearing loss (diagnosis before age 2 years) Aided threshold moderate to severe Devices not stated.	Electropalatography (EPG) and ultrasound.

Study	Country	Study design	Subjects	Intervention
Bernhardt B, 2003 (Bernhardt, B., Gick, B., Bacsfalvi, P., & Ashdown, J. 2003)	Canada	Multiple case studies	Four subjects Adolescent (16-18 yrs) 3 male, 1 female Severe to profound sensorineural hearing loss (males); fluctuating and progressive sensorineural hearing loss (female) Aided threshold normal to severe Devices: Hearing aids.	Electropalatography (EPG) and ultrasound.
Bernhardt B, 2005 (Bernhardt, B., Bacsfalvi, P., Gick, B., Radanov, B., & Williams, R. 2005)	Canada	Multiple case studies	Four subjects Adolescent (16-18 yrs) 3 male, 1 female Severe to profound sensorineural hearing loss (males); fluctuating and progressive sensorineural hearing loss (female) Aided threshold normal to severe Devices: Hearing aids.	Electropalatography (EPG) and ultrasound.
Bow CP, 2004 (Bow, C. P., Blamey, P. J., Paatsch, L. E., & Sarant, J. Z. 2004)	Australia	Observational study	17 subjects Children (5 yrs 3 mths – 11 yrs 10 mths), 9 male, 8 female. Average pure tone unaided threshold (45-110 dBHL). Devices: Hearing aids (7); cochlear implants (10).	Audio-verbal training: Phonological and morphological training.

Study	Country	Study design	Subjects	Intervention
Clendon S, 2003 (Clendon, S., Flynn, M. C., & Coombes, T. 2003)	UK	Observational study	Five subjects Children (mean age 12yrs 2mths), gender not stated. Unaided threshold profound. Devices: Cochlear implants.	Computer software intervention for speech production and awareness (SpeechViewer III and Earobics)
DesJardin JL, 2006 (DesJardin, J. L. 2006)	USA	Observational study	32 subjects (mother-child dyads) Mothers (23-53 yrs, mean age 36.3). Children (25-72 mths, mean age 36 months). Average pure tone unaided threshold (15-88.8, mean 65.2 dBHL). Devices: Hearing aids.	Maternal involvement in language skills development.
DesJardin JL, 2007 (DesJardin, J. L. & Eisenberg, L. S. 2007)	USA	Observational study	32 subjects (mother-child dyads) Mothers (20-44 yrs, mean age 36 yrs). Children (30-86 mths, mean age 57.3 months). Unaided threshold: Severe to profound (1), profound (38) Devices: Cochlear implants	Maternal involvement in language skills development.

Study	Country	Study design	Subjects	Intervention
Dornan D, 2007 (Dornan, D., Hickson, L., Murdoch, B., & Houston, T. 2007)	Australia	Case control study	58 subjects (29 cases + 29 normal hearing controls) Experimental group: Children (mean age 3.79 yrs), 21 male, 8 female. Mean pure tone average 76.17 dBHL. Devices: Hearing aids and/or cochlear implants.	Auditory-Verbal Programme.
Ertmer DJ, 2000 (Ertmer, D. J. & Maki, J. E. 2000)	USA	Multiple case studies	Four subjects Adolescents (age range 13yrs 3 mths - 15yrs 9mths), 4 female. Unaided pure tone average 83.3-115 dBHL. Devices: None.	Spectrographic displays vs non-instrumental instruction (no display).
Hogan S, 2008 (Hogan, S., Stokes, J., White, C., Tyszkiewicz, E., & Woolgar, A. 2008)	UK	Observational study	37 subjects Children (age unclear – preschool), gender not stated. Hearing loss: Profound (60%), severe (27%), moderate (13%) Devices: hearing aids (38%), cochlear implants (13%), transition from HAs to CIs (49%).	Auditory verbal therapy programme

Study	Country	Study design	Subjects	Intervention
Justice EC, 2008 (Justice, E. C., Swanson, L. A., & Buehler, V. 2008)	USA	Multiple case studies	3 subjects Children (5yrs 4mths – 8yrs), 3 female. Severe-profound sensorineural hearing loss. Devices: cochlear implants.	Narrative-based language intervention
Massaro DW, 2004 (Massaro, D. W. & Light, J. 2004a)	USA	Multiple case studies	Seven subjects Children (age range 8yrs – 13yrs), 2 male, 5 female. Aided hearing threshold mild to moderate. Devices: Hearing aids (6), cochlear implant (1)	Computer-animated talking head (Baldi®).
Massaro DW, 2004 (Massaro, D. W. & Light, J. 2004b)	USA	Multiple case studies	Eight subjects Children (age range 6-10 yrs), 2 males, 6 female. Average auditory device threshold (21-52 dBHL) Devices: Hearing aids (7), cochlear implant (1)	Computer-animated talking head (Baldi®).
Paatsch LE, 2001 (Paatsch, L. E., Blamey, P. J., & Sarant, J. Z. 2001)	Australia	Observational study	Twelve subjects Children (age range 5 – 10 yrs), 5 male, 7 female. Pure tone average hearing threshold (45-115 dBHL) Devices: hearing aids (6), cochlear implants (6)	Articulation training using phonetic and phonologic level training

Study	Country	Study design	Subjects	Intervention
Paganga S, 2001 (Paganga, S., Tucker, E., Harrigan, S., Lutman, M., Paganga, S., Tucker, E. et al. 2001)	UK	Observational study	Eighteen subjects Adult (parents of children with hearing loss). Age and gender not specified. Devices: children fitted with cochlear implants.	Parent training (Hanen) course
Pratt SR, 2003 (Pratt, S. R. 2003)	USA	Case study	Single subject Child, 13 yrs, male. Severe to profound sensorineural hearing loss. Device: hearing aids	Computer-based visual feedback training.
Rhoades EA, 2001 (Rhoades, E. A. & Chisolm, T. H. 2001)	USA	Observational study	Forty subjects Children (age range 4 – 100 mths, mean age 44 mths), 22 male, 18 female. Aided pure tone average 15-120 dBHL (mean 53dBHL). Devices: Hearing aids (33%), cochlear implants (37%), transition to cochlear implants (30%).	Family focussed auditory-verbal training programme.
Schopmeyer B, 2000 (Schopmeyer, B., Mellon, N., Dobaj, H., Grant, G., & Niparko, J. K. 2000)	USA	Observational study	Eleven subjects Children (age range 4 yrs 10 mths – 11 yrs 5 mths, mean age 7 yrs 6 mths), gender not stated. Hearing loss: not stated. Devices: Cochlear implants	Computer-based language-auditory training (Fast For Word™)

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