Auditory Processing Disorders in Children

A theoretical and clinical perspective

Chyrissé Heine

This paper presents an overview of the area of auditory processing disorder from a theoretical and clinical perspective. Both diagnostic and management strategies and issues are discussed.

Keywords:
- auditory processing disorder
- auditory processing
- central auditory processing disorder
- diagnosis
- management

An increased number of referrals and increased demand for professional services have made the area of auditory processing disorders a pressing issue. The term auditory processing is, however, not novel and has been mentioned and discussed in previous years. In the 1960s and 1970s, the area of auditory processing was linked to other sensory modality difficulties and associated with learning disabilities (Kirk & Kirk, 1971). The psycholinguistic approach proposed by Kirk and Kirk (1971) authors constituted a basic theoretical model providing assessment and management strategies for auditory processing deficits. Within the field of audiology, similar developments were made and assessments used to evaluate the central auditory nervous system (CANS) and retrocochlear system were introduced (including measures such as the Synthetic Sentence Word test (Katz, 1977) and speech-in-noise tests). Although psycholinguistic processing and CANS assessments remained popular for a number of years, auditory processing as a deficit area per se decreased in popularity.

The 1990s saw a revival of the area, and in 1996, the American Speech and Hearing Association (ASHA) published a consensus statement (ASHA Taskforce on Central Auditory Processing Consensus Statement) regarding central auditory processing (American Speech and Hearing Association, 1996). This document is viewed as pivotal to the conceptual development of the area, particularly since the CANS was identified as the anatomical site-of-lesion, the function of the CANS in processing auditory stimuli was recognised and numerous discrete auditory processes were specified. More specifically, this document defined central auditory processes as the auditory system’s mechanisms responsible for sound localisation and lateralisation, auditory discrimination, auditory pattern recognition, temporal aspects of audition and auditory performance decrements with competing and degraded acoustic signals. Based on this delineation, individuals (children or adults) with deficiency of the CANS, and thus decreased performance in any of these specified auditory processes, are clinically diagnosed as having a (central) auditory processing disorder or (C)APD.

Definition and clinical characteristics

Numerous definitions of auditory processing have been proposed. Katz, Stecker and Henderson (1992) defined auditory processing as “the use we make of the auditory signal” (p. 4), while Kelly (1995) defined auditory processing as “what we do with what we hear” (p. 6). Although useful in terms of explanation to parents regarding the meaning of auditory processing, these definitions are not sufficient in themselves to differentiate the auditory mechanisms responsible for auditory processing. Alternatively, McFarland and Cacace (1995) defined auditory processing disorder (APD) as a modality-specific perceptual dysfunction, not due to peripheral hearing impairment. Stach (1998) proposed that APD presents as “communication disorders that resemble hearing impairment” and are related to “idiopathic dysfunction of the central auditory nervous system” (p. 100).

Katz et al. (1992) described auditory processing as serial and parallel processing of the auditory system, responsible for auditory attention, detection and identification of auditory signals, decoding of the neural message as well as storage and retrieval of auditory-related information. Numerous characteristics associated with APD have been reported in the literature. Chermak and Musiek (1992) suggested the following deficits or behaviours as consistent with APD: difficulty comprehending speech in demanding listening situations (for example, due to increased background noise or a speaker’s use of unclear speech), reduced auditory attention, poor concentration span, increased distractibility, inconsistent awareness of auditory stimuli, and academic achievement lower than predicted by intelligence measures. According to Heine (2002), children with APD frequently have difficulty in the areas of auditory memory, auditory closure, sound awareness, discrimination, blending and segmentation skills, an inability to follow complex verbal directions and attend to verbal information for long periods of time. Emerson, Crandall, Seikel, and Chermak (1997) appropriately described APD as a multidimensional concept based on a constellation of related deficits.

In an attempt to further refine the area of central auditory processing, leading professionals in the area (primarily audiologists) attended a consensus conference in Texas in April, 2000. The outcome of discussions (overviewed by Jerger & Musiek, 2000) included the recommendation that the term “auditory processing disorder” (APD) be adopted with the rationale put forward that:

in keeping with the goals of maintaining operational definitions, avoiding the imputation of anatomical loci, and emphasising the interactions of disorders at both peripheral and central sites... it seems more appropriate to label such problems as “Auditory Processing Disorder” or APD. (Jerger & Musiek, 2000, p. 467)

By adopting the term APD, the peripheral hearing mechanism is not negated. In the literature, the terms CAPD, (C)APD and APD are used interchangeably, depending on specific author’s individual preference.

Diagnostic measures

A further important issue discussed at this consensus conference included the identification of acceptable measures used to evaluate central auditory processing. Screening...
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measures, such as the Screening Test for Auditory Processing Disorders (Keith, 1986), were identified as useful for screening purposes, but not recommended as diagnostic measures. A minimal assessment battery was suggested and included electrophysiological as well as behavioural measures. Behavioural measures are auditory in nature and include: monaural low-redundancy speech tests (to assess an individual’s ability to hear and repeat speech produced in non-redundant and redundant listening conditions), tests of dichotic listening (to evaluate an individual’s ability to process and repeat stimuli presented binaurally and simultaneously), tests of temporal ordering (where the listener makes judgements based on the temporal order or sequence of auditory stimuli) and tests of binaural interaction (to assess an individual’s ability to process disparate but complementary information presented binaurally).

Historically, consensus development and position documents have inextricably linked theoretical perspectives with clinical orientations. With regard to assessment, a number of authors have supported the view that a comprehensive audiological assessment (a test battery approach using measures sensitive to central auditory dysfunction) is required to diagnose the presence of APD (Chermak, 2001; Jerger & Musiek, 2000; Keith, 1999; Cacace & McFarland, 1998). It is thus recommended that audiologists use a core battery of tests to evaluate the CNS, with selection of additional tests dependent on the individual client’s difficulties.

In accordance with the areas delineated by Jerger and Musiek (2000), it is apparent that a number of measures have been used to evaluate central auditory processing; however, specific details regarding their use and availability are obscure. Also, some assessment measures such as the Staggered Spondaic Word test (Katz, 1977) are more widely used than others. Since uniform appraisal (test selection) is not recommended, measurement decisions are based on individual client’s needs and requirements and in many instances, test batteries differ between individuals. Chermak and Musiek (1997) described the advantages of using a test battery approach as including the notion that collating test results can confirm the diagnosis of APD (particularly if trends are apparent on varying assessment measures) and information gained from the numerous assessments can be useful in designing rehabilitative programs. Disadvantages of using a test battery approach according to these authors include: the need for complex interpretation and non-specific pass-fail criteria resulting in conflicting test results.

The lack of both normative data and empirical research results compounds the clinical decision-making process. Clinical decisions are thus made according to clinician’s theoretical orientation and bias. However, in spite of these proposed disadvantages, it is still recommended that in assessing central auditory processing, minimum criteria according to the 2000 consensus be met.

The diagnosis of APD requires multidisciplinary collaboration, since APD has been associated with language delay/disorder, learning difficulties, attention deficits and various pathologies, such as recurrent otitis media (Friel-Patti, 1999; Sloan, 1998). Multidisciplinary assessment procedures are based on team members’ expertise. For example, the educational psychologist may evaluate verbal and non-verbal performance, while the educational specialist may be able to provide important information regarding the child’s literacy. In contrast, the speech pathologist may evaluate specific areas of auditory processing, including auditory-based language tasks (for example, auditory comprehension) and auditory-based literacy tasks (for example, auditory analysis). Differential diagnosis is critical to differentiate a “pure” auditory processing deficit from a primary memory, attention, language, literacy or cognitive deficit. That said, it is acknowledged that for some clients, an auditory processing disorder may be inextricably linked to a language and/or literacy deficit.

Diagnostic considerations and multidisciplinary collaboration generates information that can guide client management. Diagnostic procedures should therefore typically identify clients’ auditory processing strengths and weaknesses so that individualised management programs are formulated to meet clients’ specific needs (Heine, 2002).

Management

Following assessment, clinical decisions are made regarding the need for intervention, auditory areas to be targeted and type of intervention program required, among others. A first step in this process is often the differentiation of children into categories. A comprehensive model outlined by Katz (1992) differentiates clients into deficit areas including those with a phonemic decoding deficit, tolerance-fading memory deficit, integration deficit or organisation deficit. This categorisation scheme may form the basis for identifying target areas for intervention. Therapeutic aims are thus based on clinical findings and intervention aims to improve dysfunctional processes through therapeutic activities. Activities should be deficit-specific in nature, yet aimed at maximising generalisation across a variety of communication and learning situations.

Chermak and Musiek (1992) suggested that intervention should include auditory training, metalinguistic and metacognitive strategies. According to Bellis (1996), target areas should include: environmental modification and teaching suggestions, remediation techniques to enhance discrimination, interhemispheric transfer of information and neuro-auditory functions and provision of compensatory strategies.

An auditory processing training program currently being developed by the current author (Heine, 2003) includes the following auditory processing targets: auditory awareness, identification and discrimination, rhyme, rhythm, noise desensitisation techniques, memory techniques, metalinguistics, auditory closure, sound blending, auditory analysis, synthesis and syllabification, as well as communication strategy usage. For all clients, it is also suggested that learning and communication environments are acoustically optimal (through acoustical control and FM systems, if required) and that clients are provided with strategies to compensate for their auditory difficulties.

With regard to management, the literature reflects disparate, anecdotal descriptions of management techniques, and a paucity of empirical clinical-based studies is apparent. Furthermore, clinical disputes exist regarding APD profiling, the choice of intervention program required and the attributed benefit of intervention. Clinical decisions are therefore based on clinician’s professional background, theoretical bias and diagnostic methods utilised.

Conclusions

Multidisciplinary teamwork is of vital importance and the most appropriate person to implement the various aspects of the intervention program is dictated by the type of intervention required. For example, the classroom teacher can provide teaching-based classroom modifications that can aid a child in their learning environment, while the education...
specialist can play a role in improving a child’s auditory-based literacy skills that can assist spelling and reading. Within the area of auditory processing, the speech pathologist’s role includes providing intervention (in the areas of auditory processing, auditory-based language and auditory-based literacy tasks), making appropriate referrals for assessment and intervention to other educational, medical and allied health professionals as well as providing expertise in team-discussion meetings. Within the school setting, team members often include the classroom teacher/s, special education specialist, psychologist, occupational therapist, among others. Collaboration between team members is required to prioritise intervention options, institute effective environmental strategies and provide information regarding the client’s progress. Recognition of the client’s individual auditory profile and the adoption of a holistic multi-disciplinary approach to intervention will benefit the client. The area of APD is therefore complex, filled with a variety of theoretical perspectives, opinions and descriptions. By increasing knowledge of APD, clinicians are “confronting the challenges of the unknown and embarking on the journey towards knowledge” (Bellis, 1996, pp. 277, 278). Ongoing scientific and clinical research is therefore imperative to improve diagnostic procedures, develop alternative intervention options and provide parents, professionals and the community with increased awareness and knowledge of APD in children.

References


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AUDITORY PROCESSING DISORDER

Literacy, behaviour and classroom practice

Katherine Rowe, Jan Pollard and Ken Rowe

Children with auditory processing difficulties commonly have inattentive behaviours and literacy underachievement. A standardised screening protocol using taped voice to measure digit span and recall of sentences of varying length (2–12 words) was administered by teachers to 900 children (mean age 5.7 years). Measures of literacy development and attentiveness were obtained from the “trial” sample, and from a matched “reference” sample. Teachers in the “trial” schools were also provided with information regarding normal auditory processing development, and practical classroom management techniques. The implementation of these strategies by teachers in the “trial” schools had significant positive effects on literacy scores and attentiveness.

Keywords:
- auditory processing
- behaviour
- controlled trial
- literacy
- school entry
- teacher professional development

Background and context

Children who are inattentive or disruptive are at high risk of poor achievement progress in literacy (Hinshaw, 1992; Rowe & Rowe, 1999). Approximately 9% of children have both literacy and behaviour problems and the long-term consequences of these are costly emotionally, socially, educationally and economically (Barkley, 1995; Rutter, 1974). Many of these children are referred to paediatricians and psychologists for assessment as to whether learning difficulties or attention deficit problems are contributing factors to their behaviour at school. Similarly, many are referred to audiologists for hearing tests in the event that their difficulties in listening and following instructions may be due to deafness, or to speech pathologists regarding speech and language difficulties.

Over many years, the Audiology Department at the Royal Children’s Hospital in Melbourne has formally assessed these children. When such children can hear well, it is recognised that they have difficulty in processing what they hear. Thus, auditory processing is defined as the ability to hold, sequence and process accurately what is heard. This ability to recall auditory information is typically measured by the length and complexity of a sentence and the number of pieces of information (e.g., digits) that are recalled accurately. Such ability increases rapidly between the ages of 3 and 9 years, and many parents and teachers intuitively adapt the length of their sentences to suit the child’s age. However, a delay in this development frequently suggests that a child does not appear “to listen”, and does not follow verbal instructions or directions. Unfortunately, crucial teaching and learning “milestones” are missed, especially if there is no adjustment to the length of instructions given. Moreover, children with auditory processing problems have difficulty acquiring sound–letter links (phonemic awareness) or basic phonological knowledge (see Bradley & Bryant, 1983; Munro, 1997).

The majority of children referred to the Royal Children’s Hospital for assessment of problems with underachievement in literacy have been noted to have problems with processing auditory information. Previously, help for affected children was not sought until they were in grades 5 or 6. These children had significant externalising behaviour problems, were distressed, and were often having problems with literacy. More recently, however, the increasing number of referrals of children in the early years of schooling with concerns related to inattentiveness have highlighted the prevalence of auditory processing difficulties at this earlier stage.

The finding that many children have such difficulties has significant functional implications for teaching and learning in the classroom. Despite the fact that the majority of children with this problem do not have other learning difficulties, children with conditions such as attention-deficit/hyperactivity disorder (AD/HD), specific learning difficulties, language disorders or intellectual disability may also have difficulty with auditory processing. Children for whom English is a second language or where language content is unfamiliar may have a functional difficulty in processing information that improves with familiarity. From clinical practice, it has been noted that awareness by the child, parent and teacher of the difficulty, and taking such difficulties into account when communicating with the child, results in marked improvement in the growth of literacy skills.

In addition to the use of good “first wave” teaching strategies for literacy acquisition, it is also important to identify individual children who may require management strategies that can be implemented easily in the classroom. Since affected children have minimal difficulty learning if material is presented in appropriate ways, a means of recognising these children early and preventing ongoing disability seemed sensible.

To this end, a study was undertaken to: (1) assess a screening tool for use by teachers to identify those children at school entry with auditory processing difficulties, and (2) to assess the impact of teacher professional development on children’s literacy achievement and attentive behaviours when appropriate classroom management strategies for auditory processing difficulties are used.

Method

Study design

A standardised screening protocol using a taped voice to measure digit span and recall of sentences of varying length (2–12 words) was administered to 899 preparatory/kindergarten children (mean age 5.7 years) as part of a trial of school entry screening procedures. The sample was drawn from 60 classes in 34 primary schools using in a stratified, cluster-designed, “probability in proportion to size” (PPS) design. Measures of literacy development (Concepts About Print; Clay, 1993) and behaviour (Attentiveness; Rowe & Rowe,
Measured variables

In addition to ESL and Gender, data on the following measures were obtained on 2 occasions (May and Nov.–Dec.) for children in both the “reference” and “trial” schools:

1. CAP: Score on a standardised literacy screening protocol – Concepts About Print (Clay, 1993). The observed score is a continuous variable with a typical score range 0–24 at this level of schooling (5–6-year-olds). Reliability is reported to be α = 0.92 (Clay, 1993).

2. ATTENT: Score on the Inattentive–Attentive scale of the RBRI 12-Item Teacher Form (Rowe & Rowe, 1997, 1999). Continuous scores on this scale range from 1 (min.) to 5 (max). Reliability is reported to be r = 0.96; α = 0.93.

During Phase 1 of the study in “trial” schools, two measures of children’s auditory processing capacities were obtained by teachers trained in the screening protocols (which took approximately 7 minutes per child):

1. DSPAN: Score on a standardised, screening device using taped voice to test auditory recall; categorised as: < 2 digits, 3 digits, 4, digits, > 5 digits (Reliability: r=rt = 0.95).

2. SENTL: Score on a standardised, orally administered protocol, indicating the number of words correctly recalled from a presented sentence. Scores on this continuous variable typically range from 2–12 at prep/kindergarten level (Reliability r=rt = 0.96).

Prior to administration of the auditory screening protocols, each child (in both “trial” and “reference” schools) was screened for ability to hear a whispered voice. If a child’s hearing was not adequate, the auditory processing screening did not proceed and a recommendation was made that the child be assessed by an audiologist.

Results

Differences between classes/schools

Of the residual variance in children’s Concepts About Print scores at the second stage (CAP2, adjusted for CAP1 scores) in both “trial” and “reference” schools, 46.1 per cent was due to variation between classes/schools. Given this result, it was vital that multilevel models be fitted to the data. This indicates that there was significant difference between class groupings of children in relation to their literacy scores (presumably related to teacher effects). This clustering effect of children within a class resulted in the variation in outcomes being greater between the groups than within the groups.

Effects of auditory processing on literacy and Attentiveness measures

The results of fitting a multilevel, MANOVA model to data obtained for the measures of literacy (CAP), sentence recall (SENTL) and Attentiveness (ATTENT), by four levels of Digit span (DSPAN), are summarised in figure 1. For illustrative purposes, this model was fitted to the data for Non-ESL children (n = 890) in the “trial” schools at the first phase of the study.

From the findings presented in figure 1, the measures of literacy (CAP), auditory processing (DSPAN and SENTL) and Attentiveness (ATTENT) are highly correlated. Indeed, the differences between the four groups (categorised by Digit span) on these measures are highly significant.

ESL and gender differences on CAP scores

Whereas there was a tendency for girls to score marginally higher than boys on the CAP measure at both phases of the
To assist interpretation for comparative purposes, the continuous scores for CAP, SENTL and ATTENT were each standardised (Z-scores) to a mean of zero and a standard deviation of one. Hence the vertical axis in figure 1 is a common metric scale of standard deviation units. To further assist in interpreting the results given in figure 1 (and also in figures 2 and 3), it is important to note that when the intervals of plots for any pair of measures do not overlap, the difference between their means is statistically significant beyond the 95% confidence level. Alternatively, when the confidence intervals for any pair of variables do overlap, the difference between their means is mostly not statistically significant.

To assist interpretation for comparative purposes, the continuous scores for CAP, SENTL and ATTENT were each standardised (Z-scores) to a mean of zero and a standard deviation of one. Hence the vertical axis in figure 1 is a common metric scale of standard deviation units. To further assist in interpreting the results given in figure 1 (and also in figures 2 and 3), it is important to note that when the intervals of plots for any pair of measures do not overlap, the difference between their means is statistically significant beyond the 95% confidence level. Alternatively, when the confidence intervals for any pair of variables do overlap, the difference between their means is mostly not statistically significant.

study, the differences were not statistically significant. However, the differences between the CAP scores for ESL and Non-ESL children were significant – in favour of Non-ESL children. Figure 2 summarises the results of fitting a multilevel, multiple analysis of variance (MANOVA) model to the obtained CAP score data, showing plots of multilevel-adjusted point estimates (means), bounded by their 95% confidence intervals.

Repeated data on the literacy and behaviour measures were obtained at a second data-collection stage (6 months later) from the same children in both “trial” and “reference” schools. At the first stage, the results of a multilevel MANOVA on data from the 34 “trial” schools, for 4 levels of digit span (i.e., ≤ 2, 3, 4, ≥ 5 digits), yielded highly significant differences for children’s literacy score, sentence length and Attentiveness (as shown in figure 1). This finding indicated that children who could recall only 2 or fewer digits had a literacy score that was approximately 1 standard deviation (SD) below the mean at school entry. Moreover, their sentence length recall was 1.5 SD below the mean, and their Attentiveness score was also 1 SD below the mean. Improved ability to recall digits was associated with significant differences in ability to recall sentences, CAP score and Attentiveness.

Seven per cent of children at school entry had a digit span of ≤ 2 digits and a sentence length of less than 8 words. An additional 15% were considered “at risk” of literacy underachievement since they either had a digit span of 3 digits but sentence length of ≤ 8 words. Teachers in the “trial” schools were generally unaware of this aspect of child development and that it has such an impact on classroom behaviours and literacy progress. They found it most enlightening to observe the responses of children exposed to the screening procedures, and were challenged to consider the implications for presentation of instructions and verbal information in the classroom.

Analyses of data obtained from the second stage of the study, indicated that the implementation of these strategies by teachers in the “trial” schools (cf. those in the “reference” schools) had significant positive effects on children’s literacy scores (especially for those children from non-English speaking backgrounds), as well as for Attentiveness – particularly by boys (figure 3). As shown in figure 3, there was a marked improvement in the Attentiveness score for boys in the trial schools, whereas in the reference schools the boys’ behaviour deteriorated. There was a mild improvement in level of Attentiveness by girls that was significant only in the “trial” schools.

Summary of key findings

- **Auditory processing is important for literacy and behaviour.** Children’s auditory processing capacities are strongly linked to their initial and subsequent literacy progress, as well as to their attentive behaviours in the classroom (figure 1).
- **Auditory processing screening and related teacher PD works!** There were significant improvements in children’s literacy progress (CAP scores) between trial and reference schools – for both ESL and non-ESL children (figure 2). Compared with children in the reference schools, variation in CAP scores for children in trial schools decreased significantly over a 6-month period. In the absence of such screening and PD (in the reference schools), the attentive behaviours of underachieving boys deteriorated (figure 3).
Follow-up of “at-risk” children is crucial.

Auditory processing screening by teachers was well accepted and recommended for inclusion in school entry assessment procedures in Victoria. Teachers strongly endorsed the value of the professional development, since many claimed to be unaware of typical variations in children’s auditory processing abilities and the implications for classroom practice (Department of Education, Employment and Training, and Royal Children’s Hospital, 2001).

**Conclusion**

The screening for auditory processing at school entry was well accepted by the teachers and the information gained in association with the professional development had a marked effect on literacy outcomes and behaviour for the whole class. Furthermore, auditory processing ability was a strong predictor for literacy achievement and behaviour at school entry, and the general effect of the intervention was particularly marked for ESL children and for boys’ attentive behaviours in the classroom.

**References**


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**Figure 3. Plots of Attentiveness scores by Gender status, school type and study phase, showing mean point estimates and 95% confidence intervals**
Central auditory processing – An audiologist’s approach

Damian Byrnes

As an audiologist working in a public hospital, I am called on to assess children’s hearing and at times the child’s central auditory processing (CAP) abilities. The ear is a complex structure that converts sound into electrical energy and transmits this energy via the auditory nerves to our brain for processing. There exists an anatomically based distinction between peripheral hearing and central hearing. Peripheral hearing refers to the ear structures to the level of the inner ear or cochlea, where sound is converted into electrical energy. Central hearing refers to the functioning of the auditory nerve pathways and more specifically the functioning of the auditory areas of the temporal lobe of each hemisphere of the brain. Hearing relies on functioning of all areas of the system and the combined effort of both systems, to enable us to hear and to hear clearly. When peripheral hearing is normal but there exists delayed development and/or disorder of the central auditory system, a central auditory processing disorder (CAPD) exists. Keith (1986) defined CAPD as “the inability or impaired ability to attend to, discriminate, recognize, or comprehend information presented auditorily even though the person has normal intelligence and hearing sensitivity” (p.3).

No universally accepted protocol or battery of specific tests for CAP assessment exists. It is not the purpose of this article to discuss the various tests that exist and have been developed to target CAP abilities, but simply to discuss a general protocol I follow in assessing CAP ability.

History

Before undertaking a CAP assessment, a comprehensive history regarding the child’s hearing must be undertaken. A pre-test questionnaire for the parent can be useful in pinpointing difficulties being experienced by the child with listening or learning. Such questionnaires are usually administered just prior to testing and only take 5 to 10 minutes to complete. It is important to establish past and present hearing problems. Children with chronic ear infections and resultant hearing loss may have been at risk of auditory deprivation, which may have led to delayed or disordered development of the central auditory system. Similarly, history of significant head injury, lack of oxygen at birth or from drowning, epilepsy or seizures, and stroke while rare in children, should be discussed with the parent. Any event that had the potential to cause neurological problems should be recorded. Any learning difficulties, and the presence of learning and disruptive behaviour (Keith, 1986, p. 4). However, most clinics do not advise performing auditory processing tests until the child is of school age and is displaying significant learning difficulties. The purpose of the SCAN is to identify children who may have language or learning problems exacerbated by CAPD (Keith, 1986, p. 6). Behaviours consistent with a central auditory processing disorder include: often misunderstanding what is said; asking for instructions to be repeated; saying “what”? often; poor auditory attention and being easily distracted; difficulty with phonics and speech discrimination; difficulty following instructions; difficulty listening in background noise; learns poorly via auditory input; and displaying disruptive behaviour (Keith, 1986, p. 5).

The SCAN test

Much research and development of tests sensitive to auditory processing has occurred in the last 20 to 25 years. Tests exist which aim to assess the child’s CAP abilities. One of the best known tests in this area is the SCAN test (A Screening Test for Auditory Processing Disorders) developed by Robert W. Keith in the early 1980s in the United States. Keith (1986, pp. 8-9) states:

- The purposes of the SCAN test are (1) to determine possible disorders of central nervous functions by assessing auditory maturation, (2) to identify children who may be at risk for auditory processing or receptive language problems who may require additional audiological and language testing, and (3) to identify children who may benefit from specific classroom management strategies to improve auditory and language processing abilities.

The SCAN test can be used with children from 3 to 11 years of age who have language disorders and/or significant classroom learning difficulties (Keith, 1986, p. 4). The SCAN test is comprised of 3 subtests. These are filtered words, auditory/figure ground and competing words. The child’s performance on the SCAN is examined in terms of child’s CAP, and or significant classroom learning difficulties who may require additional audiological management strategies to improve auditory and language processing abilities. The SCAN test can be used with children from 3 to 11 years of age who have language disorders and/or significant classroom learning difficulties. The purpose of the SCAN is to identify children who may have language or learning problems exacerbated by CAPD (Keith, 1986, p. 6). Behaviours consistent with a central auditory processing disorder include: often misunderstanding what is said; asking for instructions to be repeated; saying “what”? often; poor auditory attention and being easily distracted; difficulty with phonics and speech discrimination; difficulty following instructions; difficulty listening in background noise; learns poorly via auditory input; and displaying disruptive behaviour (Keith, 1986, p. 5).

Children with peripheral hearing loss also display such behaviours and hence the importance of peripheral hearing assessment, prior to CAP assessment, becomes evident.

The SCAN is comprised of 3 subtests. These are filtered words, auditory/figure ground and competing words. The child’s performance on the SCAN is examined in terms of each of these subtests. Norms are set for children from 3 to 11 years.

The Filtered Words Subtest evaluates the child’s ability to process degraded speech signals. This type of skill is essential in the following situations: listening to speech when not facing the speaker, processing rapid speech and processing strongly accented speech.

The Auditory Figure Ground Subtest evaluates the child’s ability to distinguish words in background noise. This is a very important auditory skill frequently required in the classroom environment when the child is asked to focus on the teacher’s voice amid background noise from other sources.

The Competing Words Subtest assesses the child’s ability to process and repeat competing speech sounds. This subtest, as
well as providing information about the child’s ability to selectively attend, perceive and integrate information presented to each ear, also provides important information about the developmental status of the auditory system. The Competing Words Subtest may also indicate whether significant right ear advantage (REA) or significant left ear advantage (LEA) exists. Ear advantage may indicate hemispheric dominance. A significant REA may be indicative of a delay in the maturation of the central auditory system, while a significant LEA is abnormal and may reflect a relative weakness of the left hemisphere where language areas are centred.

In recent years, the SCAN test has been revised to produce the SCAN-C (Test for Auditory Processing Disorders in Children – Revised (Keith, 2000)). The SCAN-C has changes such as: easier test instructions; a CD rather than a tape for improved durability; reduction from 25 to 15 in the number of test items on the competing words subtest; the addition of a competing sentences subtest; and revised normative data from 5 years and 0 months to 11 years and 11 months (Keith, 2000, p. 14). The SCAN-C is now widely in use and is preferred to the SCAN for CAP testing in children. The SCAN-A for testing CAP in adolescents and adults has also been developed (Keith, 1994).

Failures on the SCAN test are usually the result of delayed development of the central auditory system, rather than true disorder of the central auditory system. A very poor performance on the SCAN test will carry with it the recommendation that radiological examination of the brain may be necessary to exclude neurological pathology. As the brain develops, one could speculate that performance might improve over time and result in the child’s CAP difficulties extinguishing with time. Yearly testing could help to investigate if performance is improving with time or if the child maintains a delay in CAP abilities with respect to their age group. More research on the long-term development of CAP abilities in children needs to occur. Below is a list of strategies to assist the child with CAP difficulties in the classroom. This list is given to parents and teachers of children identified with AP difficulties.

1. Ensure preferential seating to maximise benefits from auditory and visual cues.
2. Avoid open plan classroom placements.
3. Gain the child’s attention prior to giving instructions.
4. Limit the amount of information in each instruction and ensure the appropriate level of vocabulary is used.
5. Rephrase important information to provide auditory redundancy (say the same thing in two different ways).
6. Encourage the child to request clarification if unsure of an instruction.
7. Monitor the child’s comprehension of instructions through asking questions relating to the subject under discussion.
8. Teach the child listening skills including when to listen for meaning rather than exact recall.
9. Encourage the development of note-taking skills to aid memory (homework diary).
10. Encourage the child to use compensatory strategies such as chunking (segmenting auditory information) and repeating aloud.
11. Supplement verbal instructions with visual cues.
12. Use of a “buddy system” to assist the child in keeping on task.
13. Pre-tutor the child in order to familiarise him/her with the new vocabulary and concepts that are to be covered the next day in class.
14. The key vocabulary for the new material can be written on the board and discussed to assist the child’s comprehension of unfamiliar information.
15. One on one assistance will be of great help to fill in the gaps in understanding.
16. Give the child frequent breaks, as significant effort is expended in attending and listening.

The use of an FM system could also be implemented. This is where the teacher wears a transmitter with lapel microphone and the student a receiver with headphones. The teacher’s voice is transmitted directly to the student and the signal-to-noise ratio optimised for the student. FM systems are recommended only where very poor performance on the SCAN test is found, particularly in the auditory figure ground subtest. FM system use may result in stigmatisation for the child and may be rejected by the child as a result. The FM system is expensive, with good quality systems costing approximately $1000 or more and must be purchased privately and insured privately by parents.

**Memory**

A short-term auditory memory assessment is also undertaken in an attempt to determine if the child’s learning difficulties are related to an inability to recall information. In many cases, children with poor attention and concentration (as in ADD or ADHD) may be found to perform normally on the SCAN test when the child is encouraged to concentrate, yet fail short-term memory testing. This tends to suggest that while sound is processed normally, poor concentration and attention leads to an inability to encode information and hence an inability to recall information.

**Auditory analysis**

The Test of Auditory Analysis Skills (TAAS) (Rosner, 1993) which evaluates the child’s ability to identify the separate sounds within spoken words and the temporal sequence in which they occur, is also undertaken. This ability is recognised as an important factor in learning to read and spell. Many children who are referred for AP assessment have reading and spelling problems. The aim of this test is to discover if reading and spelling abilities via listening are age appropriate. Failure on this test results in recommendation for an in-depth assessment of this area and higher level language areas by a speech pathologist.

Through the use of this battery of tests it is expected that peripheral hearing, central auditory processing, memory, and reading/spelling ability can be ascertained. In doing so, the audiologist can help to assist teachers and parents in targeting areas of poor performance and supply strategies which may optimise learning for children both at home and in the classroom.

**References**


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Auditory processing disorders in children
Caroline Bowen

The mushrooming scientific knowledge base that now underpins the identification and management of auditory processing disorders (APD) in children has brought with it a flurry of web activity. In a climate of increasing certainty among speech and hearing professionals that APD is a valid diagnostic entity (Jerger & Musiek, 2000), extensive information for consumers has been developed, and chat and listservs for professional and general discussion have blossomed. As well, several comprehensive overviews are available, explaining why definitions have been refined in recent years, and why the “c” for “central” in the older, more familiar term, CAPD, is gradually disappearing.

Complex disorders
Contemporary research reveals the complexity of auditory processing disorders in children (Ferre, 2001). Affected children may have problems in understanding the speech signal when background noise is present, in understanding degraded speech, in comprehending verbal instructions, or in identifying and discriminating between speech sounds.

Differential diagnosis
An APD diagnosis may reflect “central” issues where cortical functioning of the brainstem, hemispheres or corpus callosum is compromised. Alternatively, difficulties may be occurring at the level of more peripheral structures such as the cochlea mechanism and the auditory nerve. Or there may be a mix of the two, possibly complicated by specific language impairment, language processing difficulties, pragmatic issues, attention difficulties, ADHD and problems with auditory memory. The role of the audiologist is to rule out auditory neuropathy and to accurately identify the nature of the auditory processing breakdown and the level at which it is taking place.

Cross-disciplinary collaboration
Many audiologists will say that the results of in-depth language assessments by speech-language pathologists provide vital clues in pinpointing why these individuals with normal hearing sensitivity find it so difficult to make sense of auditory information. Fifty or more APD articles and documents available on the ASHA website, enter the search criterion CAPD in the search box, and click “go”) attest to the extensive collaborative research that is occurring between audiologists, speech-language pathologists and educators.

APD and school
The functional implications of APD in the classroom and other school situations, and for language learning and literacy are far-reaching (Pulaski & Moskow, 1996), and Webwords 15 highlights some of these literacy links.

References


Links
1 http://www.acenta.com/audiology.auditoryprocessing.asp
2 http://www.audiology.org/professional/jaaa/11-9a.php
4 http://slphchartarchives.homestead.com/May12002.html
5 http://maelstrom.stjohns.edu/archives/capd.html
6 http://groups.yahoo.com/group/AuditoryProcessing/
7 http://schwablearning.org/articles.asp?r=373&g=1
8 http://merrill.ku.edu/IntheKnow/sciencearticles/SLIfacts.html
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17 http://members.tripod.com/Caroline_Bowen/webwords15.htm
Find Webwords 16 at http://members.tripod.com/Caroline_Bowen/webwords16.htm

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THE SPECIAL CARE DEVELOPMENT GROUP

A model for providing ongoing care to premature infants in a health care setting

Nicole Watts

Research has shown that children born prematurely (at less than 37 weeks gestation) are at an increased risk for developmental delay (D’Agostino & Clifford, 1998). Additionally, it is believed that early intervention for these children leads to improved long-term outcomes (Skellern, Rogers, & O’Callaghan, 2001). For these reasons, the Special Care Development Group (SCDG) at the Logan Hospital was formed in March 2002.

Goals of the group

The SCDG is run by a physiotherapist, occupational therapist and speech pathologist. Its goals are to:
1. identify premature infants who present with a delay in some area of their development and facilitate their access to individual intervention;
2. provide strategies and advice to parents/carers of premature infants to encourage the development of their children’s gross-motor, fine-motor, play and communication skills with the aim of preventing the need for future intervention.

Structure of the group

All children who are born prematurely at the Logan Hospital are referred to physiotherapy. Upon seeing each infant the physiotherapist verbally invites the parents to attend the SCDG and provides them with an information leaflet. When the infant is 3–4 months corrected age a letter is sent to the family inviting them to attend the next group. Paediatricians are also able to refer premature infants to the SCDG.

The group is run monthly and has two components: (1) the education session which is of 30 minutes duration and (2) the playgroup which lasts one hour. The education component of the group alternates between targeting the two key developmental stages at 3–4 months and 8–11 months. The playgroup session is open to all children who are either in the targeted age range for the month or who have previously attended the group.

Parents are invited to the education section of the group when their baby is 3–4 months corrected age and 8–11 months corrected age. During this session parents are provided with information regarding normal gross-motor, fine-motor, play, communication and feeding development and strategies for assisting the development of these skills are outlined. Each professional speaks for approximately 10 minutes. The speech pathologist discusses the communication and feeding skills that parents would expect their child to be using at their present age. Strategies are also provided to encourage the development of these skills (e.g., tips for encouraging babbling). The talk is provided in an informal manner with toys and posters used to demonstrate the strategies rather than overheads or a PowerPoint presentation. Parents are invited to interrupt the speaker to ask questions at any stage and comments are invited from the parents during the talk.

The second part of the group is the playgroup. Children in the targeted age group for that particular month are individually screened by either an occupational therapist or a physiotherapist and a speech pathologist. The screening assessment provided by the speech pathologist briefly assesses the infants’ communication and feeding skills and relies upon both observation and parental report. As a result of this screening, individual advice and handouts may be provided or, if the infant presents with significant difficulties, the parents may be advised to seek an individual appointment. The screening time also provides parents with an opportunity to ask questions that they may have not felt comfortable discussing in front of the group.

Parents and children who have participated in the SCDG group previously are invited to attend the playgroup session every month (regardless of their child’s age). They may come to this section of the group to ask additional advice or for the therapists to review their child’s progress.

The group also provides a venue for parents to meet other parents of premature infants and acts as an informal support group. In addition, parents and infants who have difficulties that are not covered by the expertise of the therapists (e.g., postnatal depression, infants with sleeping difficulties) are referred to appropriate agencies for intervention.

Outcomes

The outcomes of the group so far have been pleasing. An evaluation form is provided to each parent at the completion of the group and the majority of responses have been positive. Parents have reported that they found the developmental information given in the talk useful and that they appreciated the opportunity for their child’s development to be screened by a number of specialists. In the year that the hospital has been running the group, five children with significant developmental delays have been identified. This identification and subsequent intervention may have happened at a much later stage if the infants did not attend the SCDG. An annual review of the running of the SCDG will identify any further changes that are necessary to ensure the group is meeting its goals and is providing effective and efficient care to premature infants and their parents/carers in the Logan-Beaudesert Health Service District.

References


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CHARACTERISTICS OF THE AGEING VOICE AND MANAGEMENT ISSUES

Bronwyn Nolan and Alison Winkworth

Forecasts suggest that from now until at least 2050 the “baby-boomer” generation will place unprecedented demands on aged-care providers for increased availability of services. It is likely also that new services will be demanded that may not have previously been considered appropriate for older people to access. The time seems right therefore to consider the needs for speech pathology services by this segment of the population and, for the purposes of this paper, those specifically regarding voice care.

Keywords:
ageing,
voice,
voice therapy

In this paper we consider the nature of age-related changes to the voice and the special issues of voice therapy for disorders of ageing. Changes to the voice as a result of ageing should be considered in the context also of other more general age-related changes affecting physiological and cognitive processes. Additionally, vocal changes should be seen in the context of the broader social influences on the individual. Social interaction is a complex need for all of us, but surely becomes more intense as we age, when the risk of isolation can be greatest. Voice difficulties may lead to increased anxiety, depression and social withdrawal, while these factors on their own may further predispose older people to voice difficulties such as muscle tension dysphonia (Rammage, Morrison, & Nichol, 2001).

Voice difficulties associated with ageing are termed presbyphonia or presbylaryngis. The incidence of age-related voice changes is difficult to determine as most studies have based their findings on treatment-seeking samples and different age groups. Additionally, the categorisation of organic and non-organic dysphonias does not always consider presbylaryngis as a separate factor. In one study the incidence of presbyphonia in a treatment-seeking sample was retrospectively assessed to be 19% (Mueller, 1997), while an earlier report observed an incidence of 30% (Hagen, Lyons, & Nuss, 1996). However, it may be difficult to distinguish between a voice problem arising from purely age-related physiological changes and that of a disease process associated with ageing (Linville, 2000). For example, in a review of 121 elderly patients with voice disorders, only 2 demonstrated dysphonia related solely to normal ageing (Morrison & Gore-Hickman, 1986). On the other hand, a more recent study of 100 adults over the age of 40 without voice disorders revealed signs of laryngeal pathology in a majority of subjects, including presbylaryngis (Reulbach, Belański, Blalock, Koufman, & Postma, 2001). In this report presbylaryngis was defined as vocal fold bowing, and was found to affect 72% of subjects. Signs of laryngopharyngeal reflux were present in 64%; however, not all subjects reported vocal symptoms.

It has been asserted that gross vocal change associated with ageing is uncommon, except in individuals of very advanced years (Greene & Mathieson, 1995). However when older clients do complain of a deteriorating voice, full investigation is warranted.

Age-related changes to the voice include alterations in the cellular structure of laryngeal tissues, neuromuscular changes and functional results such as a glottic gap. Additionally, changes in other body systems that impact on the voice are also relevant, such as decreases in respiratory capacity. Some of these changes are detailed below.

The quality of the voice depends on the vibratory capability of the layered cellular structure of the vocal folds. The outer layer of the vocal folds (the cover) needs to stay relatively loose so that it can move freely over the underlying layers (the body), thereby creating a mucosal wave during vocal fold vibration. Structural changes that interfere with this coupling affect the sound of the voice. Degenerative changes in all the layers of the vocal folds have been found associated with ageing. It has been observed that damaged tissues have less resilience and do not repair as rapidly (Ramig et al., 2001; Rammage et al., 2001).

Changes to the neuromuscular control of the larynx are also apparent in ageing, with degenerative effects observed in innervation, neural structure and blood supply (Orlikoff, 1990). Atrophy is observable, and there may be peripheral nerve degeneration and changes in the central nervous system resulting in reduced drive to laryngeal motor neurons (Ramig et al., 2001). Further, muscle cell changes result in a decreased number of fatigue-resistant (Type I) fibres in laryngeal muscles (Shindo & Hansen, 1990). Body cartilages also undergo degenerative changes associated with ageing, and these affect the thyroid and cricoid cartilages (Hagen et al., 1996).

These changes to the structure of the larynx itself should not be seen in isolation however. Other functions affected by ageing include the body’s ability to lubricate the larynx. Specifically, changes to the laryngeal vestibular glands result in dehydrated vocal folds and this contributes to irregular vibration (Ramig et al., 2001; Sato & Hirano, 1995). All these changes result in weaker, less efficient adductory mechanisms, with concomitant reduced fine motor control of laryngeal muscles, resulting in vocal instability (Ramig et al., 2001). These functional effects would also be compounded by other body systems altered with age such as respiratory capacity which is markedly reduced in old age (Hollien, 1987).

The perceptual characteristics most associated with “old” sounding voice include hoarseness or harshness, vocal tremor and instability, increased breathiness and strain, reduced loudness and altered pitch (Ramig et al., 2001).

Changes in speaking fundamental frequency as a result of ageing are well known. These are characterised by an increase in speaking pitch for men (Linville, 2000). Women can experience perhaps a slight rise in fundamental frequency in old age (Mueller, Sweeney, & Baribeau, 1984), after a drop in speaking pitch after 50 years of age which is presumably due to hormonal effects of menopause (de Pinto & Hollien, 1982). Both men and women experience restricted maximal frequency ranges in older age and there is reduced stability of the voice
reflected in increased frequency and amplitude perturbations (Linville, 2000).

Maximum phonation time is a measure of respiratory and phonatory capabilities. A reduction in this parameter may be a result of any combination of reduced respiratory capacity and phonatory ability. That is, the combination of reduced power for the voice (respiratory system) and reduced laryngeal valving of the airstream (vibratory source) would most likely reduce maximum phonation time.

One of the most prolific authors in the area of vocal ageing is Linville (e.g., 2001). She has stated that age-related voice changes involve two principal factors overall: (1) loss of tissue elasticity and (2) muscle weakening. Other age-related effects relate to general physical decline such as joint stiffening and reduced respiratory capacities. Additionally, Linville noted men show more dramatic voice changes than women (Linville, 2001).

Many of the physiological changes to the voice appear to lead to glottal insufficiency which affects the efficiency of vocal function (Ramig et al., 2001; Linville, 2001). However the configuration of any glottic gap may vary depending on the individual. Linville (2000) suggested that glottic gaps vary in relation to the muscles affected. For example, a weakening in the thyroarytenoid muscles may result in incomplete closure from the vocal processes to the anterior commissure, but weakness of the interarytenoid muscles produces a glottic chink. Linville (2001) suggested that incomplete closure along the length of the glottis occurs if the adductor muscles are weakened in general. There is conflicting evidence regarding glottal insufficiency in women, however, because some types of glottic gap are very common across all age groups. These include posterior glottic chinks, which frequently occur without perceptual voice effects.

In relation to the functional effects of glottic gap it is important to understand that individuals may attempt to compensate for the gap (and any associated voice quality) by increasing adductory force (Higgins & Saxman, 1991). This may result in strained voice quality (Linville, 2001). Therapy activities may therefore be complicated by the need to consider the interplay between physical factors and compensatory vocal function.

Consideration of age-related changes to the voice should also include other medical conditions of the client (e.g., hypertension) and medications that may directly or indirectly affect the voice. In women, hormonal changes may be relevant. Regardless of age, the possibility of laryngopharyngeal reflux should also be included. Therefore, in any voice consultation, an individual’s overall health, lifestyle and vocal habits should be considered.

Management issues of ageing voice

The proportion of Australia’s population aged 65 years and over is currently 12.5%. It is expected to nearly double (increase to 24%) by 2051. Ageing of the population is a result of improved life expectancy and a reduction in the fertility rate. The Australian Bureau of Statistics (2001) has forecast that as the youngest of the surviving baby boomers reach 65 years of age in 2031, the population aged 65 years and over is expected to reach 5.4 million, more than double the current population aged over 65 years. Even more dramatic will be a rise in the proportion of the population aged 85 years or over. Currently, people aged 85 years or older make up just 1.2% of the population. As the youngest baby boomers reach this age in 2051, the number of people aged 85 years or older will be more than 5 times what it was in 1999. The over 85 age group will then represent 5% of the population. These are staggering statistics if we also consider the additional impact of continuing advances in health care, prolonging life into older age. While we may expect to live longer, there are fewer projections regarding health status. We may live for a longer period of time but still experience chronic health problems that reduce the quality of that life.

The ageing baby boomers may be more conscious of the importance of good health habits in old age compared to previous generations. They are probably also more aware of the effects of poor health on quality of life. It is likely that this generation will demand an increase in health care services not just in the area of primary care, but also in allied health and ancillary health industries. The demand for health care will therefore not only increase but the types of services required may also change. There may be an increased focus on preventative programs for example, and service delivery methods will change.

There are currently no empirically derived guidelines for management of vocal deterioration due to ageing. However, some authors have offered what appear to be logical conclusions for maintaining vocal fitness and improving glottal function. There is evidence that if optimal physical health is maintained into old age, acoustic characteristics of voice can be considered relatively youthful (Ramig & Ringel, 1983). Vocal and other physical training may offset or delay age-related voice changes (Linville, 2001). Lifestyle factors and health care habits would therefore be appropriate to consider in any management program for the voice.

Functionally, the predominant overall goals for speech pathology management of voice disorders associated with ageing appear to be:

- maximising glottal sufficiency – i.e., achieving the most efficient and complete vocal fold adduction without inducing vocal strain or hyperfunction, and
- optimising voice quality, loudness and pitch appropriate to the individual at the same time, since the perceptual voice characteristics may most likely be the basis of the client’s chief complaints.

Other goals may relate to improving vocal stamina if vocal fatigue is one of the complaints. Voice therapy techniques that focus on a training effect may be beneficial. This may include techniques such as Stemple’s Vocal Function Exercises (Stemple, 2000).

Vocal hygiene information is critical. There is growing evidence of the importance to the voice of maintaining hydration, which is problematic for older people. Well hydrated vocal folds assist more efficient vibration and may be more resilient to damage (Verdolini-Marston, Titze, & Druker, 1990; Verdolini, Titze, & Fennell, 1994). Thirst perception may also decrease with age. Therefore it is important to counsel clients about the need to maintain water consumption. Collaboration with medical professionals is important, however, because of medications with diuretic or other dehydrating effects that may be necessary for older people with some medical conditions.

Choice of a particular voice therapy approach will be dictated by the likely pathophysiology of the diagnosis. If a client is overcompensating for a glottic gap by exerting additional adductory force, deleterious hyperfunction or strain may result and this could be a valid focus in voice therapy. Some authors have commented on the vocal fatigue-hyperfunction vicious circle (Harris, Harris, Rubin, & Howard, 1998). Compensatory vocal abuse may therefore result and require treatment.
For the reasons outlined above attention to detail is needed in the recommendation of any vocal techniques to address presumed hypofunction. Despite this caveat, some studies have reported success with therapy techniques emphasising improved adduction. For example, pushing exercises have met with success (Mueller, 1997), and a small study of the Lee Silverman Voice Treatment in older people reported positive results (Ramig et al., 2001).

Conclusion and service delivery issues

Age-related changes to the voice are well documented, but distinguishing them from age-related disease processes is difficult. Treatment choices for these voice difficulties therefore should include consideration of the likely pathophysiology underlying the problem. The ageing of the population presents opportunities for new innovations in service delivery. Voice therapy in a group model is one obvious possible solution, and more attention may be given to vocal hygiene and voice training in speech pathology health promotion messages targeted at older clients. Such a model could incorporate social aspects that address individuals’ participation in addition to impairment and activity. For example, singing is an enjoyable vocal social activity that can have training benefits for the voice when taught and practised correctly. Speech pathologists and other voice professionals such as singing and theatre voice teachers can work together to achieve these aims.

References


Useful reading


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Visit www.speechpathologyaustralia.org.au
As the Australian population ages, there is increasing focus on the provision of speech pathology services to older clients in nursing homes and hostels. The use of these services depends to a large extent on the policies of the individual care facility and funding patterns, as well as on staff awareness of communication disorders and swallowing difficulties. Current policies and practices create many challenges that may have the effect of limiting much needed access to speech pathology services.

Keywords:
- aged care,
- hostels,
- nursing homes,
- service provision

Speech pathologists may be employed in therapy centres attached to retirement villages, which provide various levels of care, including nursing home and hostel type accommodation. The dichotomy between nursing home and hostel is in fact becoming more blurred, due to the “aging in place” policy of more recent years, with greater numbers of high level care residents remaining in designated low care facilities.

Where no day therapy centre exists, speech pathologists are generally not employed by nursing homes or hostels. Private practitioners may be called in by a facility or by the family. Residents who have high care needs should have such a service paid for by the nursing home facility, whereas residents with low care needs are required to fund the service themselves. In practice there is frequently reluctance to utilise private practitioners due to issues such as cost and availability, and in some cases, staff are not aware of the need or potential benefits. Yet it has been asserted that the majority of residents within a nursing home experience various communication disorders, which are not easily identified by staff and therefore not usually referred for further assessment or management (Palmer & Henderson, 1993).

Resident Classification Scale

The instrument that outlines each resident’s care, the Resident Classification Scale, is also the funding tool for all residential care facilities. This continues to evolve from the Resident Classification Instrument previously utilised in nursing homes, and the Personal Care Assessment Index from hostels. Previously, funding to nursing homes included an allocation of 8% to be spent on allied health input (Hamilton, 1993), but allocation of these funds is now the responsibility of the individual facility. Physiotherapists, diversional therapists and assistants are frequently employed to cater for high care need residents. Other allied health staff are less commonly employed.

Across 20 questions on the Resident Classification Scale, each resident is assessed and classified from least to greatest need on an A to D scale. This assessment is used to determine a person’s capabilities, needs and problems so that an appropriate individual care plan can be developed.

For calculating the level of care and thus funding, the director of nursing, nurse manager or senior clinical registered nurse applies weighted values for each claim (A to D). The total score then falls into a specified range for one of eight categories (categories 1–8). Unfortunately weightings for question 1 “communication” and question 3 “meals and drinks” are relatively low compared to areas such as toileting and personal hygiene. To claim funding based on question 19, “therapy”, input is needed from an allied health professional or from staff within the facility (e.g., diversional therapist or assistant in nursing) carrying out a prescribed program at least several times a week. The final rating arrived at is based on the documented needs of the care recipient. Documented interventions need to be clear and specific, stating what is actually done. Care plans must be written for each resident addressing every question where a claim is lodged.

Care facilities are subject to reviews by standards monitoring teams that have the authority to increase or decrease funding across the eight categories. Categories 1 to 4 cover high level care, 5 to 8 cover low level care, with each category attracting a different level of remuneration. Accreditation teams also review care plans and match these to the care being given to residents when they look at the overall performance of a residential care facility.

Service delivery

Residents in aged care can have problems in all areas of speech, language, voice, hearing and swallowing. With the complexity of medical conditions, they frequently need speech pathology input for a combination of difficulties.

Conventional face-to-face assessment and treatment is the most recognised service delivery model; however, Palmer and Henderson (1993) outlined the key elements of a consultancy model which include liaison about roles with the director of nursing, clarifying funding arrangements, educating staff, implementing change and evaluating services. Treatment by the primary provider, trained care staff or volunteers may be on an individual or small group basis.

Regardless of whether the speech pathologist is employed or working in a facility as a private practitioner, individual assessments of residents are required, as well as staff education for managing swallowing and communication problems.

The speech pathologist can assist a facility to increase funding by supporting the identification of communication, hearing and swallowing difficulties, and by guiding formulation of care plans to achieve optimal benefit to residents as well as maximal government assistance. The speech pathologist may contribute to appropriate care plans in areas such as meals and drinks, communication, medication or may write a separate speech pathology care plan.

Some studies have reported as many as 98% of nursing home residents and 92% of hostel residents as having communication disorders (Smith-Worrall, Hickson, & Dodd, 1990). In one study, 70% of high care residents failed on two
or more measures – hearing loss, cognitive deficits, dysphagia, poor speech intelligibility, voice problems and pragmatic deficits (Kato, Hickson, & Worrall, 1996). Hearing loss and language problems associated with cognitive deficit were the most common problems (Smith-Worrall et al., 1990; Worrall & Hickson, 1995). Clark (1993) said that “inability to communicate is not a loss of life, but a loss of access to life” (p. 549). Communication ability is a major key to maintaining quality of remaining life.

Swallowing problems have likewise been identified in high proportions in nursing homes – 68% quoted by Steele, Greenwood, Ens, Robertson, and Seidman-Carlson (1997) and a range from 50 to 75% in other studies in a review by O’Loughlin and Shanley (1998). Other eating-related problems including poor oral intake, positioning problems and challenging behaviours may or may not be associated with dysphagia but contributed to 87% of residents identified as having mealtime difficulties (Steele et al., 1997).

Although several programs, articles and books have been created to assist aged care staff to gain greater understanding of residents’ communication and swallowing problems (e.g., Dodd, Worrall, & Hickson, 1990; Jordan, Worrall, Hickson, & Dodd, 1991; Kato et al., 1996; O’Loughlin & Shanley, 1996), these have probably not been utilised to their greatest advantage. It has been suggested that staff underestimate the contribution hearing loss makes to the communication difficulties of residents (Burnip & Erber, 1996), and while staff were aware of some of the obstacles to communication, they were not always able to assess opportunities for communication, nor ways of optimising such communication. Swallowing on a Plate (O’Loughlin & Shanley, 1996) and other resources have not been fully utilised in my experience in Queensland. There is clearly a great need for more attention to staff and carer education in these areas.

**Personal experience**

In Brisbane I am currently working 15 hours per week for each of two employers, based in day therapy centres.

In one situation I service seven separate facilities with over 300 high care and 200 low care residents. Three facilities are exclusively high care with approximately 20% of hostel residents also classified high care. Three facilities have dementia-specific secure areas. There are three different locations. Because of demands I spend very little time with community clients who may attend the centre; however, a nearby hospital can frequently cater for such clients at their day hospital.

In my second situation, 55 beds are designated high care and in the vicinity of 20–25% of 115 hostel residents are classified at category 3 or 4 (high care). I am thus able to see a higher number of community clients in the centre. These people are not well catered for at other centres in the locality.

The largest numbers of residents I see are referred for swallowing difficulties. It is assumed that safety is the major issue in the mind of referrers, although more recently weight loss has been highlighted by both standards monitoring and accreditation teams.

Frequently, a client is referred soon after being admitted to a facility. However, this referral may be unnecessary if speech pathology input has occurred during a resident’s recent acute hospital admission, as guidelines from the previous hospital are generally appropriate. At times, referrals are more for mealtime management problems rather than specific swallowing difficulties. The number of referrals for changes in swallowing function varies according to staff knowledge of dysphagia and alertness to a resident’s condition. Positioning of residents during mealtimes is a further major issue, which is the focus not only for care plan documentation but also for staff, family and volunteer education.

Monitoring compliance with thickened fluid consistency and food texture recommendations is an ongoing task. Colodny (2001) found that the main reason for registered nurses’ non-compliance with recommendations was lack of knowledge, and for nurse assistants the main reason was disagreement with recommendations. However, in the places that I work, I have observed that there is much variation in the degree of compliance, the level of knowledge and agreement with recommendations.

The supply of food texture and fluid consistency also needs to be monitored. In my experience kitchen staff sometimes abandon standard recipes, thus varying fluid consistency and increasing the potential risk of aspiration, dehydration or malnutrition. Providing staff education over time is difficult when there are several food preparation areas and a high turnover of staff, which is frequently the case.

There is further potential for misunderstanding when a resident’s communication difficulty may be misinterpreted as another condition by staff. In one example, a resident with severe verbal dyspraxia was considered demented, “wandering, and needing assistance to mobilise”, when despite remaining effectively non-verbal, she was able to live relatively independently in the residential environment. Referral of residents with speech and or language difficulties is often couched in terms such as, “Please supply communication chart”. This “solution”, as speech pathologists are aware, is frequently not appropriate, and there is no quick fix. The progression from a “C” claim to a higher level of need (D claim) is based almost entirely on whether alternative communication is used or not. My experience indicates a great deal more staff time can be spent with a resident struggling with verbal communication than with someone who can use an augmentative or alternative communication device. There is clearly a need for ongoing staff education in these areas, which may not currently be adequately funded.

Residents with multiple needs for assistance with communication and swallowing present further challenges. The initial referral may have related to swallowing, but it is difficult and frustrating both for resident and speech pathologist to ignore or delay involvement with the communication problem.

**Conclusions**

Speech pathology services to the elderly are still only partially organised, both in institutional care and in the wider community. Because of high levels of government funding to residential care, it is left to the private sector administering nursing homes or hostels to employ or request the services of speech pathologists. Actual service delivery is dictated by time constraints and by perceptions of those responsible for referring residents and utilising speech pathology services, as well as by negotiated agreements between supplier and facility. Some networks of speech pathologists, however, have been more formally instituted. One example is the Speech Pathology Special Interest Group in Ageing (SPIGA) in Queensland.

If we are to meet the needs of the ageing population in a proactive manner (Worrall & Hickson, 1993), further innovations in service delivery are needed. A consultancy model should emphasise identification of swallowing and communication problems, adjusting the conversational and physical environment to cater to residents’ needs (Palmer & Henderson, 1993). Further, liaison, consultation and in-
Integration of goals and services should be emphasised with other allied health staff to promote more positive attitudes to communication opportunities and dysphagia management. Education of service providers, care and support staff, family members and volunteers should also be paramount.

References


Julie Pring has worked as a speech pathologist in Brisbane for the past 21 years. Most of her work has been with older people in residential, post acute, rehabilitation, and palliative care.

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Q & A: QUESTIONS AND ANSWERS ABOUT SPEECH PATHOLOGY

Send in your questions, write some responses
Alison Winkworth

Q & A is a new segment in ACQ which we hope will provide a lot of information in a small amount of space. Readers can submit questions to be answered, or responses to published questions. Any topic relevant to members of Speech Pathology Australia is welcome. Responses to questions should not be more than 450 words, and helpful references to further reading are encouraged. In some cases a range of responses to a particular question will be sought. We will also commission responses from other professionals. In this issue we highlight a response by Sydney ear nose and throat surgeon and voice specialist, Dr Jonathan Livesey, about sinuses.

Questions
1. What is the disorder called cluttering?
2. What radiation exposure is usual in a videofluoroscopic examination of swallowing (i.e., modified barium swallow)? How is the total exposure determined?
3. What is the current evidence about the relationship between otitis media and language delay? If a child has hearing loss, it makes sense that their language stimulation will be limited. Why does there seem so much controversy therefore about the relationship?
4. What is CPAP for, and what is the reason for using CPAP (continuous positive airway pressure) as an intervention in a hospital speech pathology caseload?
5. I’ve heard that speech pathologists sometimes have caseloads in intensive care units. What is their role there?
6. Why are sinuses important for speaking or the voice, and do they have any other functions?
7. What is the relevance of Systemic Functional Grammar for everyday speech pathology practice? Do we really need to know it?
8. How much post acute stroke rehabilitation do public patients get in speech pathology in Australia?
9. What is vocal fatigue?

Answers to some of these questions appear in this issue.

If you have a question or a response you would like to submit, send it with your full contact details to The Editor, ACQ, Speech Pathology Australia, 2nd floor, 11–19 Bank Place, Melbourne, Vic. 3000; email: pubs@speechpathologyaustralia.org.au; fax: (03) 9642 4922. Answers to questions should be 450 words or less, and comply with the guidelines for authors listed on the inside back cover regarding formatting and style.

Answers should minimise jargon and be written so they can be understood by any speech pathologist, not just those working in the relevant caseload or topic area.

Question: Why are sinuses important for speaking or the voice, and do they have any other functions?

Answer:
Oddly enough no one has really explained why the nasal sinuses exist. Some people have a congenital absence of some or all of their sinuses with no detrimental effects. One might think that sinuses lighten the skull. However, elephants, with the largest land-based skulls, do not have sinuses. Maybe this accounts for the quality of their song.

The nose is an air conditioner to clean, warm and humidify inspired air. In the process the lining mucosa is liable to become dry and dirty. The sinuses are lined by the same respiratory mucosa as the nose and the two anatomical areas should be considered as one. The sinonasal system secretes one litre of mucus a day which is used to maintain good mucosal health. The mucus is wusted into the throat by the minute lining hairs (cilia).

The sinuses should be air-filled and contribute to the resonance of the voice. Inflammation or infection of the sinonasal system can have a number of vocal effects. Initially as the nose and sinuses block we perceive that our own voice is flatter. This may cause an inappropriate vocal compensation with deterioration in vocal skill. As the blockage worsens others may become aware of the vocal difference.

In addition to reduced vocal resonance, sinonasal pathology has other vocal consequences. Nasal obstruction will reduce air quality and require increasing amounts of mouthbreathing of cold, dry and dirty air. The mouth, pharynx and larynx will dry excessively since they are not designed to humidify. This will cause some vocal irritation. The draining nasal mucus may be thickened or infected which will also irritate the pharynx and larynx and contribute to coughing. Coughing will exacerbate the laryngopharyngeal reflex (LPR) of stomach contents that we all have on a daily basis. Laryngitis will ensue which will be either simple inflammation due to irritation and coughing or infected secondary to the infected post nasal mucus. There may be pains in the head, sinuses or throat.

Asthmatics will have an exacerbation of their symptoms due to the sinonasal, laryngeal and LPR effects as well as the greater risk of a chest infection. Individuals with symptomatic LPR will have increased difficulties due to coughing. Tonsillitis may occur due to mouthbreathing, fatigue and relative immunosuppression or the infected post nasal drip.

Overall the individual with short- or long-term sinonasal disease may have a feeling of malaise due to an infection, excessive vocal tract drying, poor quality sleep (secondary to nasal obstruction), increased LPR, coughing, pain, diminished breath control and fatigue. All of these factors contribute to reduced vocal skill and ability. It is therefore of paramount importance for voice professionals to take steps to avoid or rapidly curtail any sinonasal symptoms.

Jonathan Livesey
ENT surgeon and voice specialist
Sydney
to the upper airway during both inspiration and expiration. The most frequent medical use for this treatment is to maintain airway competence during sleep in people with obstructive sleep apnoea.

Speech pathologists can use CPAP to improve velopharyngeal closure. Such therapy has been advocated for improvement of velopharyngeal function in hypernasal speech (Kuehn et al., 2002; Kuehn, 1991).

A mask is fitted over the patient’s nose, through which low pressure air is pumped. If the patient’s mouth is closed the air flows into the lungs. If the mouth is open, it flows out through the mouth. The patient is then asked to speak, and has two conflicting airflow: the lungs and the CPAP. Physiologically, the easiest way to manage these conflicting inflows is to lift the soft palate and prevent the CPAP airflow from entering the oral cavity. If the patient has any potential for achieving velopharyngeal closure, CPAP can provide a resisted exercise program for the soft palate.

Velopharyngeal dysfunction is also evident in some patients with dysphagia. Aetiologies that may result in poor velopharyngeal closure include bilateral cortical strokes, brainstem stroke, head injury, cleft palate, head and neck cancer, maxillofacial surgery, and, at times, chronic obstructive airways disease.

Poor velopharyngeal closure in itself has a negative impact on swallowing because of changes in oropharyngeal pressure. Some patients may also employ inappropriate tongue humping during the swallow to compensate for the poor closure and thus reduce swallowing coordination (Selley, Roche, Pearce, Ellis, & Flack, 1995).

Patients may show strong clinical evidence of poor velopharyngeal function such as poor soft palate elevation on phonation, nasal emission on high pressure sounds like /s/, or hypernasal speech. They may complain of nasal escape of food or fluids on swallowing, or tickling in the back of their nose when they swallow liquids.

Other less clear clinical signs include reduced loudness of speech, inability to sneeze or blow the nose, excessive extrinsic facial or neck muscle tension. Good lip seal for speech, inability to sneeze or blow the nose, excessive nasal escape, pursing of lips, and air escaping from the nose when they swallow liquids.

Therapy sessions are usually once or twice daily, and these slowly increase from five to ten minutes per session. The pressure of the CPAP is increased at weekly intervals. Treatment continues for approximately two months.

Cindy Dilworth
Speech Pathologist
Royal Brisbane and Women’s Hospital

References

Question: What is vocal fatigue?
Answer: 1

Although there is no universally accepted operational definition of vocal fatigue, this term is most often considered to mean reduced vocal endurance of the speaking and/or singing voice. The phenomenon is probably best viewed from the perspective of the speaker or singer because it is not yet clear what the most sensitive and specific physiological, perceptual and acoustic features of vocal fatigue are.

The person who complains of vocal fatigue typically reports symptoms including an increase in the physical and mental effort required to produce voice, with other factors such as throat discomfort, an increased need to clear the throat, a feeling of “tiredness” in the throat and/or the general body, reduced pitch and loudness range and control, inability to sustain long phrases, impaired voice quality and projection, and irregularity in vibrato.

Laryngeal examination does not show consistent findings, although a spindle shaped glottis, vocal fold oedema, and an anterior glottal chink are commonly reported features (Titze, 1994).

A promising physiological measure of vocal fatigue is phonation threshold pressure. Phonation threshold pressure is the minimum lung pressure required to initiate and maintain vocal fold vibration, and has been shown to increase during and following vocally fatiguing tasks (see for example, Solomon & DiMattia, 2000). Further research is needed, however, because several recent studies have demonstrated that phonation threshold pressure recovers to normal levels far more quickly after fatiguing vocal activities than does the person’s sense of vocal effort and fatigue.

In addition, we still do not know what the underlying physical mechanisms of vocal fatigue are; proposals include an increase in the viscosity of the cover of the vocal folds, reduced blood circulation to laryngeal muscles, reduced subglottal pressure due to respiratory muscle fatigue, vocal ligament strain, and laryngeal muscle fatigue. The least likely hypothesis is laryngeal muscle fatigue because it is now understood that intrinsic laryngeal muscles are generally resistant to fatigue (Solomon & DiMattia, 2000).

Most clinicians and authorities in the voice field, as well as patients themselves, assume that vocal fatigue is caused by hyperfunctional behaviours such as strained vocalisation and voicing at high loudness or pitch levels, inefficient projection and respiratory support, or use of the voice in polluted or poor acoustic environments.

Poor general health and fitness, inadequate water intake, medical conditions such as laryngopharyngeal reflux and allergy, and performance anxiety and general stress are also implicated as contributing factors to vocal fatigue. There is some research evidence to support vocal hyperfunction and inadequate hydration as causes (Gelfer, Andrews, & Schmidt, 1991; Solomon & DiMattia, 2000; Verdolini, Titze, & Fennell, 1994), but the validity of the other factors listed here has not been established.

With so much more to be learned about vocal fatigue, it is difficult to be prescriptive about the most effective approach to managing this very common problem. Further, there is virtually no research evidence to support the effectiveness of particular treatment methods for fatigue (Welham & Maclagan, 2003). If the main cause of the vocal fatigue is vocal overuse, then it is logical to assume that simply stopping the vocal hyperfunction will resolve the problem.

If the vocal behaviour that induced the fatigue ceases, then recovery is likely to occur within approximately 24 hours.

1 Acknowledgement: This response was previously printed in Voiceprint: Newsletter of the Australian Voice Association, No. 23, April 2002–May 2003. It has been reprinted with the permission of the author and Voiceprint editor.
(phonation threshold pressure can return to normal in much less time, perhaps as quickly as a few hours).

This approach to managing an acute episode of vocal fatigue, however, is unlikely to be effective for professional voice users such as teachers where the ongoing vocal demands of their occupation are conducive to vocal fatigue.

In this situation, specific treatment to increase the person’s vocal endurance is likely to be required so that the individual learns how to prevent future vocal fatigue. Research evidence for this proposition comes from studies demonstrating that reducing vocal hyperfunction alone is not as effective as vocal exercise (e.g., Carding, Horsely, & Docherty, 1999; Roy, Gray, Simon, Dove, Corbin-Lewis, & Stemple, 2001). We also know that trained voice users are less susceptible to fatigue than untrained people (see Solomon & DiMattia, 2000, for a review), again supporting the notion that vocal training can protect the voice user from fatigue.

Recent voice texts outline a large number of vocal exercises that are considered to improve vocal technique and vocal endurance. Unfortunately, most of these methods are not supported by research evidence of their effectiveness in the specific case of vocal fatigue. There is sufficient evidence available from studies of voice therapy for related conditions, however, to support the use of Stemple’s Vocal Function Exercises, Resonant Voice Therapy, the Accent Method, manual circumlaryngeal therapy, and respiratory control exercises for patients who suffer from vocal fatigue (e.g., Basiouny, 1998; Roy, Bless, Heisey, & Ford, 1997; Stemple, Lee, D’Amico, & Pickup, 1994; Verdolini-Marston, Burke, Lessac, Glaze, & Caldwell, 1995).

Whether or not such voice training methods actually “strengthen” vocal tract muscles is a moot point. There is little evidence that muscle strengthening occurs. Because laryngeal muscles are not readily fatigued, however, does this lack of evidence really matter? It is more important that the techniques listed here are known to be effective and that as long as they are used with careful monitoring of vocal fatigue symptoms by the individual and, preferably, a voice clinician, no vocal damage will result.

Finally, we should also remember that, in addition to vocal exercise, people who suffer from vocal fatigue are likely to need advice on hydration and that attention to general fatigue, anxiety and stress, general health and fitness, and medical conditions such as reflux is a wise course of action.

References


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Upcoming Themes for ACQ

February 2004 – Practical/Functional/Measurable

June 2004 – Aphasia

October 2004 – Outcome Measures

Articles on other topics are welcome.

See inside back cover for article submission details and submission dates.
From the Journals

Debra Braund and Nicole Watts

Communication skills in people with Parkinson’s disease


People with Parkinson’s disease (PD) may experience severe difficulties with social communication, even before the disorder affects motor systems involving gesture and speech intelligibility. There is a paucity of literature in regards to pragmatic communication deficits and people with PD. Therefore these authors performed two studies. The first study aimed to assess the pragmatic communication abilities of patients with PD and examine the relation between these and measures of frontal lobe function. Twenty patients with PD were matched to 10 control participants. The following assessments were used: Pragmatic protocol (Prutting & Kirchner, 1987), FAS Verbal fluency test (Lezak, 1995), Minimal state exam (Folstein, Folstein & McHugh, 1975), interference condition of the Stroop colour-word test, Tower of London task and Design fluency task. It was found that patients with Parkinson’s disease were significantly impaired in the areas of conversational appropriateness (pauses, feedback, conciseness), prosodic aspects, gestures and facial expression. The patients with PD did not differ from controls on general measures of cognitive skills; however, measures of pragmatic function did correlate with measures of frontal lobe function. The second study examines the PD patients’ self-awareness of their deficits. Eleven patients with PD (who did not participate in study 1) rated themselves on the Pragmatic protocol. Their spouses also rated the patient’s abilities and these ratings were then compared. Results partially confirmed a clinically significant pragmatic communication deficit in PD and also found that patients consistently overestimated their communication abilities. Implications and limitations of these studies and future research were discussed.

Speech management for patients with cleft palate


This paper discusses the basic principles in regards to the speech management (evaluation and treatment) of individuals born with cleft palate. Early primary surgery to repair the palates is preferred – cleft lip is typically operated on by 3 months of age and cleft of the hard and/or soft palate is repaired between 9 and 12 months of age. Children born with cleft palate should be given normal language stimulation and be encouraged to produce oral sounds, even if these sound nasal. Hyper- and hyponasality is discussed in reference to velopharyngeal closure. It is important to distinguish between the type of velopharyngeal impairment (VPI) as this affects the type of treatment offered. Assessment of VPI can be conducted using non-instrumental tests such as mirror test and nostril pinching test using non-nasal and nasal words. Instrumental procedures such as still x-ray (cephalometry), motion x-ray (videofluoroscopy) and nasendoscopy can provide useful information that can help determine the specific type of treatment to be recommended. Depending on the diagnosis, speech treatment, secondary surgery or both will be necessary. Treatment for glottal stops, secondary surgical procedures and behavioural treatment (CPAP treatment) are discussed further.

Auditory skill development in children with cochlear implants


Increasingly children with cochlear implants are being seen in classrooms and on caseloads throughout the educational system. This article reviews the current research on the auditory, speech and language skill development of children with cochlear implants. Studies have shown that children with implants learn language at the same rate as children with normal hearing; however, they experience some difficulties with syntax. Speech production in children with implants is clearer than in children who use hearing aids, as the implant normalises several aspects of articulation such as fundamental frequency and breathiness. It has also been shown that children with implants who use oral communication have higher speech intelligibility and speech perception than children with implants who use total communication. Research also indicates that better speech recognition is associated with earlier implantation, therefore auditory learning potential is enhanced. However, it is essential to provide systematic exposure to auditory information for progression in auditory skills, including speech perception, speech production and the development of language and academic skills. A program of auditory skills development (using the four levels of awareness or detection, discrimination or pattern perception, identification and comprehension) and suggested activities, which have been proven to be effective for children with cochlear implants, are described.

Humming and vocal quality


“Humming” is a direct vocal therapy technique that is used in the treatment of hyperfunctional voice disorders. The client produces an “m” sound at an optimal pitch level, and focuses on easy, natural vocal production. “Humming” is believed to facilitate less forceful adduction of the vocal folds and decrease tension in the supralaryngeal area during vocalisation. However, few studies have investigated its effectiveness in the treatment of voice disorders.

In this study, the effect of humming on the voice quality of eight women with hyperfunctional voice disorders and eight women with normal voice quality was investigated. The women all received two sessions of humming voice therapy, which involved producing an “m” sound in isolation and in syllables. Recordings were made before and after the
treatment sessions. No other information (e.g., on vocal hygiene) was provided to the women.

Three experienced judges assess samples of the clients’ speech using instrumental and perceptual measures. The results indicated the humming led to a significant decrease in perceptual roughness for both the clients with disordered voice quality and the clients with normal voice quality. However, no changes in perceptual breathiness or the acoustic measures (fundamental frequency, jitter, shimmer and harmonic to noise ratio) were observed.

RESOURCE REVIEWS

Carol Bishop; Speech Sounds on Cue. Contact details: Multimedia Speech Pathology, 1 Rafael Place, Robina, Qld 4226; email: Carol Bishop cbishop@southcom.com.au; A$169 (GST exempt), plus $8 postage and handling. Further information can be found at www.mmsp.com.au.

Elise Baker

An important aspect of any speech production treatment regime is practice. According to Caruso and Strand (1999), practice is the most important aspect of speech motor learning. It helps a relatively conscious behaviour become habituated towards more automatic processing (Caruso and Strand, 1999). Speech Sounds on Cue is a multimedia program designed to provide clients with the opportunity for speech production practice. It can be used by clients during treatment sessions with their clinician or independently under the direction of their clinician. According to the program designer, Carol Bishop, Speech Sounds on Cue can be useful with adults who have apraxia and/or aphasia, children with autism spectrum disorder, people with hearing impairments, children with articulation difficulties and students of English as a second language.

The Speech Sounds on Cue program provides activities for production practice of 19 Australian English consonant phonemes. Each phoneme can be practised in isolation using full motion video clips. The video clips provide clear auditory and visual models of the phoneme articulated by a speaker. Written and spoken cues accompany the video clips. Each phoneme can also be practised in syllable-initial word initial position in words. For each word the following is provided: a colour photo to illustrate the word meaning, a video clip of a person’s mouth articulating the word, an animated written cue, and an auditory recording of a speaker saying the word in a sentence. There is the opportunity to repeat each word after each attempt. In total 531 words cover 19 consonant phonemes. Australian English phonemes targeted include: /z, ð, ȝ, j/ An A4 booklet containing a colour photo of each consonant, the target words and their trigger sentences can also be printed from the CD. An A3 colour poster of each consonant, the target words and their trigger sentences can also be printed from the CD (or purchased for $18 from the supplier). Easy-to-follow “help notes” are also provided. The program is quite easy to use. Once the CD is inserted into the CD-ROM drive, the program starts automatically, and is accompanied by easy-to-follow instructions.

Although the program provides the opportunity for production practice of 19 English consonant in words, it does have some limitations. The word stimuli only target consonants in initial position. Some of the words may be difficult for clients to articulate due to the coarticulatory effect with other consonants within a word. For instance, clients with velar fronting may find the words “kid” and “card” difficult due to the presence of the alveolar consonants. Of the 531 words, 94% are monosyllables and 6% disyllables (of which 97% are limited to the “strong–weak” syllable stress pattern). Thus, there is limited scope for working on words of increasing syllable structure, and differing stress patterns – both skills that frequently pose difficulty for people with dyspraxia.

Another limitation is the lack of consonant clusters across the 531 words. Specifically, there are no initial clusters and only nine instances of the final /st/ cluster, one of /nd/, one of /nz/ and one of /ŋk/. Thus, again the program is limited in scope given that consonant clusters (particularly initial two and three element clusters) frequently pose a problem for adults and children with dyspraxia. With regard to clinical use, repetitive practice of the sentences can mean that the client “rote learns” the words. This was the case for an adult with dyspraxia who trialled the program. Some of the sentence stimuli make the target words more predictable than others. Although this certainly has the advantage of the client having success with “predictable” words, it has the potential to frustrate the client, when he or she can achieve some words “easily” and not others. Finally, some of the vocabulary items (e.g., lame, debt, copper, cheque, Gin) and sentence prompts (e.g., “Voting at the polling ... booth”; “He arranged a bank ... loan”) would not be suitable for all children, particularly preschoolers. However, the program may be suitable for school-aged children with residual articulation errors involving /s, 0, r/, bearing in mind that the program is limited to initial position, and the cognate pairs /z, ð/ and /s, 0/ are not targeted.

Overall, the program is relatively inexpensive (A$169 or $85 for students/clients) and has the potential to be a useful clinical tool, primarily for speech pathologists working with adults with a communication impairment.

Reference


Carol Bishop, Sights ‘n Sounds. Contact details: Multimedia Speech Pathology, 1 Rafael Place, Robina, Qld 4226; email: cbishop@southcom.com.au; $199.00 for the Deluxe version, $249.00 for the Professional version, and $165 for the Home version, plus postage and handling. Further information can be found at www.mmsp.com.au. Hardware requirements include: 10MB hard drive space, sound card, speakers, microphone, 256 colour display, Microsoft Windows 3.1, 3.11, 95, 98, NT.

Donna McNeill-Brown

Bungalow Software (www.BungalowSoftware.com), the developers of Sights ‘n Sounds, state that this program covers...
a number of content areas (semantic, phonemic, word finding, reading) and is suitable for a variety of clinical populations (e.g., ESL, paediatric, adult). Three versions are available:

- Deluxe Version – add your own content, including photos and recordings.
- PRO Version – add your own custom lessons, including 5-computer site licence.
- Home version.

*Sights 'n Sounds* is a CD-ROM based program comprising seven lessons:

1. Consonant–vowel syllables, organised by initial sounds;
2. Single syllable words, organised by initial sounds;
3. Single syllable words, organised by ending sounds;
4. Pictures, words, and sounds of things (nouns) (103 exercises);
5. Pictures, words, and sounds of actions (verbs) (45 exercises);
6. Words and sounds for abstract concepts (141 exercises);
7. Custom lesson.

Each lesson consists of a number of exercises involving a particular CVVCV sound pair or word. The first three lessons and the lesson for abstract concepts do not include pictures; the picture, words, and sounds lessons use colour photographs. Items may be displayed in random order if desired.

The exercise window covers the full screen. In the picture, words, and sounds lessons, the upper half of the window contains colour photographs, sized approximately 10 cm square. Beneath the picture is a white bar containing the matching word written in lower case. The text feature can be hidden if desired, turning the lesson into a word finding exercise.

Underneath the text bar is the audio console, which consists of 5 buttons: back, playback, next, play model and record. There is also a window that allows the user to switch between different exercises. All buttons have picture symbols as well as writing displayed. A sample exercise may involve:

- clicking on “play model”;
- listening to the model of the word;
- clicking on “record” to record the user’s version of the word;
- clicking on “playback” to hear the user’s voice;
- clicking on “play model” to compare the user’s voice to the model.

If a custom lesson is chosen, a picture can be added from the existing library, or a picture can be imported from another application or scanned-in material (this was not tested). Any text can be entered in the text bar, and a model can be recorded. The sound volume can be changed and tested. Automatic cueing can be varied, for example, the text can be hidden, or the model can be played back at different times. There is also a Help section which can be accessed for assistance with various features of the program and lesson.

### Evaluation

The *Sights 'n Sounds* program was easy to install, with self-explanatory prompt boxes along the way. The program is easy to navigate and understand once it has been used a few times; however, it might be a good idea to include an instruction manual for people not familiar with computers. The headings, prompt buttons, and text are large and legible, and the symbols on the buttons are a good idea, even though not all are very transparent (e.g., the “playback” button).

The program can also be navigated by just using the space bar, which is a useful feature when used by people with reduced fine motor skills.

The custom lesson feature is probably the most useful part of the program, enabling therapists to design and save lessons and use their own voice as a model. This would also make the exercises more culturally flexible. The voices used for the program have an American accent, and some frames show the American expression for the item, e.g., “french fries” instead of “chips”.

Another reason for using the custom lesson feature rather than or in addition to the existing items, is to provide consistent speech characteristics. On the existing program, the spoken models of words varied in clarity and intelligibility. For example, it was not always clear whether the initial sound of a word was /g/ or /d/. Context such as the picture and text helps to understand the word, but the verbal model is not always optimal. In addition, /s/ endings on plurals etc. were difficult to hear sometimes. The use of earphones may improve clarity for the listener. Lastly, the speed of presentation of words seemed a little too fast at times.

The pictures used are generally good quality colour photographs, and relatively culture-neutral. Some photographs are a little grainy. In the custom lesson feature, additional photographs can be scanned in, enabling the therapist to make the lessons more client-focused. Some of the photographs need to be considered in terms of their appropriateness, for example, those depicting people smoking and shooting, and young children bathing or swimming with no or little clothing on.

The Words and sounds for abstract concepts can be useful; however, concepts do not seem to be grouped in any way, and include a number of terms (e.g., “heart”, “stomach”) which could be depicted easily and are not necessarily abstract. This section could perhaps be used more purposefully as a Custom lesson.

Overall, this program can be a useful adjunct to therapy in a number of content areas, such as phonology, semantics, or ESL. Younger school-age children would probably benefit most from this program, for example when working on consonant deletion. However, adults (e.g., adults with aphasia) could also make use of it in different ways. As with any such software, it is important to ensure feedback and reinforcement are presented simultaneously with the program, by the therapist, parent or carer.

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Visit [www.speechpathologyaustralia.org.au](http://www.speechpathologyaustralia.org.au)
The 2003 Speech Pathology Australia Conference: A closer look at the stuttering module

As many readers would know the Speech Pathology Australia National Conference was held at Wrest Point Casino, Hobart, 4–8 May. The venue was spectacular – views of the Derwent River and gorgeous, sunny days. Hobart itself is a pretty city with much to offer in terms of good cafes, restaurants and pubs! Additionally, some of us also enjoyed an outing to Government House to a reception hosted by the Governor of Tasmania, Sir Guy Green. However, apart from enjoying many good eateries, we did spend time at the conference itself.

One module that was of interest to me was the stuttering module. This was coordinated by Margaret Webber (Stuttering Unit, Bankstown Health Service) and Gillian Carmichael (PhD student at the University of Technology, Sydney). Elisabeth Harrison, who recently completed her PhD in stuttering and now lectures in the speech pathology Masters Program at Macquarie University, introduced the module. She spoke on a topic of great interest to many speech pathologists: evidence based practice (EBP). She discussed EBP and contrasted it with other frameworks, concluding that EBP can be used by clinicians in everyday clinical treatments with clients who stutter.

The following summaries highlight the diverse range of research currently underway in the field of stuttering.

Sue Block (Atkins, Block, Bryant, McGartland, Dacakis, Menzies, McColl, Onslow, & Packman) presented a follow-up study on the effect of cognitive behaviour therapy (CBT) on treatment outcomes in adults who stutter, a study conducted at LaTrobe University. She contrasted the results of an earlier study (3 months post treatment) with longer term results (12 months post treatment). The short-term results indicated that there was no significant difference in the amount of stuttering reduction between an experimental group (who had smooth speech and CBT) and a control group (who had smooth speech only). Longer term results showed that CBT did not significantly improve maintenance of fluency. Considering this finding, the authors expressed reservations about routinely including anxiety management when treating adults who stutter.

Gillian Carmichael (Carmichael, Craig, Tran, & Hancock) presented some of her PhD data. Her study investigated the neuropsychological differences between 16 stuttering children and 16 non-stuttering children (aged 8–14 years) with electroencephalography (EEG) in connected spoken language tasks. A subgroup of 13 children who stutter received a group intensive prolonged speech treatment and were followed with EEG up to 3 months after treatment. Results showed that stuttering behaviours pre and post treatment corresponded to decreased neural processing in the targeted left hemispheric language areas of the brain (F7 and T3), suggesting that these areas might be involved in developmental stuttering. The authors argued that these findings add to the body of evidence that suggest a physical basis for the disorder and emphasise the importance of early intervention for children who stutter.

Mark Onslow (Huber, Packman, & Onslow) presented a paper on treatments for adolescents who stutter. A randomised control trial (RCT) of 3 treatments (EMG biofeedback, prolonged speech and time-out) is currently underway and pilot data on three adolescent males using the EMG biofeedback were presented. The authors reported that the results failed to replicate the Craig, Hancock, Chang, McReady, Shepley, McCaul et al. (1996) findings with school-age children. Replicability issues with this procedure were raised and authors concluded that the inclusion of EMG in the RCT may be unjustified.

Verity MacMillan, a speech pathologist at the Stuttering Unit, Bankstown Health Service, presented a case study of a 17-year-old stuttering adolescent treated with self-imposed time-out. Time-out is a response-contingent stimulation technique that requires the client to stop speaking briefly immediately after stuttering. In this single case study favourable treatment results were obtained.

Liz Spencer (Spencer, Packman, Onslow, & Ferguson) presented preliminary results from a study looking at the impact that stuttering has on how people use language. Using the Systemic Functional Linguistic model, she investigated the use of the linguistic resource of modality in two adults who stutter and two matched controls. Modality was defined as a resource for expressing interpersonal meanings (e.g., using words such as must, probably, maybe), the elements of language used to express opinion and interact with people through language. The results indicated that the two adults who stutter used the resource of modality less than the matched controls. The researchers hypothesised that reduced frequency of modality may indicate less willingness to engage in conversation, and that people who stutter may limit their verbal output to content aspects of a message as a way of avoiding or limiting stuttering. Further studies into the use of this resource by people who stutter is underway.

Katherine Pye (Pye & Block) presented findings of a study looking at whether the type of stuttering behaviour had a relationship to treatment outcome following the smooth speech treatment at LaTrobe University. The Lidcombe Behavioural Data Language was used to describe the stuttering of 74 adults pre and post treatment. Results showed that the most successful participants exhibited predominantly fixed postures pre treatment but that all their stuttering types decreased post treatment. For less successful participants (> 2%SS), no predominant behaviour type was
I presented preliminary data from my PhD research (Rousseau, Packman, Onslow, & Harrison) in the poster section. This study is investigating the impact of language performance on treatment time with the Lidcombe Program. Language performance of 10 preschool children was measured with the PPVT-3 and the CELF-P. Results showed that there was no evidence that performance on these tests influenced how long children took to complete stage 1 of the program.

As with papers and posters presented in the other modules, the stuttering module was stimulating. As ever, the main problem is not being able to attend all the presentations you would like. Hopefully, next year’s conference at IALP in Brisbane will attract as many quality presentations as did this year’s conference. For more detailed descriptions of the papers presented here, and others as well, readers are referred to the forthcoming 2003 Speech Pathology Australia Conference Proceedings.

References

My Top Ten Resources

Brenda Carey
I am a private practitioner who has a special interest in stuttering. I enjoy providing a varied service to my clients, which may include individual therapy and group therapy, in both intensive and non-intensive formats.

1 My mentor
The best teachers inspire you to do better work without being aware of it. Mine is Susan Block from La Trobe University.

2 My clients
I learn a great deal by listening – adult clients have far greater experience in stuttering and its effects than I do.

3 A confident, encouraging manner
This is particularly important when during early phases of therapy I may require the client to speak in an unnatural sounding way.

4 A rating machine
(True Talk Professional Speech Rater is manufactured by Synergistic-Electronics; phone: (03) 6327 2048; approximate cost: $500 + postage)
This item is well worth its cost. It saves time, allows for on-line feedback, and facilitates evidence based decision-making.

5 Video camera
Used for pre and post therapy evaluations, during therapy to provide feedback and during maintenance to demonstrate a good model of the fluency techniques.

6 The La Trobe University Smooth Speech Program
Provides an excellent framework for therapy and helps to ensure that therapy is progressing at an optimal pace.

7 The Speak Easy Association
Provides support to the individual who stutters and his/her family. Small meetings also provide the opportunity to practise fluency and communication skills, as well as emotional support.

8 The telephone
I use telephone conversations as a means of assessing the client’s fluency. It is especially useful for clients with very mild stutters and for clients needing to practise phone calls in a very structured, hierarchical fashion.

9 Games
(e.g., Scruples, Taboo, Mindtrap: available from department stores)
These are useful for those occasions when conversational topics are running dry.

10 The Stuttering Interest Group of Victoria
These regular meetings are highly informative, consisting of case discussions, literature reviews, conference updates, and so on. Welcomes those with a special interest in stuttering as well as clinicians who are wanting to discuss a tricky stuttering-related issue.
**MY TOP TEN RESOURCES**

Cindy Dilworth

Hi, my name is Cindy Dilworth and I’m a speech pathologist with the Royal Brisbane and Royal Women’s Hospital. I’ve been working in adult rehabilitation since I graduated in 1978. I found it hard to choose my “10 best” so I’ve cheated a bit and grouped some resources together. I’ve included the resources I use most often in aphasia, motor speech disorders and dysphagia but the keen aphasia therapist will note the big omission of functional communication resources. I have had the privilege of working with Bronwyn Davidson, one of great advocates for functional communication, and she has been the ultimate resource!

| **1** PALPA | Psycholinguistic Assessments of Language Processing in Aphasia (Kay, Lesser and Coltheart, 1992) was a revolution in aphasia testing when published in the 1990s. The PALPA model encourages the therapist to streamline testing, target therapy activities and it promotes the development of reflective practitioners. |
| **2** Language Rehabilitation series | (Martinoff, J., Martinoff, R., & Stokke, V. 1981, Pro-Ed: Texas) Despite the value I place on the PALPA, I continue to use some much older aphasia resources. In particular the Language Rehabilitation series provides a broad range of drills and exercises that can be readily adapted to cognitive-neuro therapy. |
| **3** Building Language: Word Sounds; Building Language: Word Meanings | (Dower, R. Mackey, J.A., 1996, Helios) A useful (and newer) resource for the aphasic with more severe problems are the Building Language books by Dower and Mackey. Building Language: Word Sounds and Building Language: Word Meanings provide graded exercises and drills supported by clear line drawings. |
| **4** Color Cards and Color Cards Library | (Speechmark) No aphasia clinic would be complete without cards. I particularly like the Color Cards and Color Card Library which include pictures of everyday objects as well as sets for verbs, adjectives, prepositions, sequential events, problem-solving and “What’s wrong?”. I also like the idea of the PACE cards although the pictures sometimes provoke interesting comments from my clients! I use minimal pair cards and with letter tiles for clients with motor planning disorders. |
| **5** Talk Now language teaching series software | (available at Harvey Norman Computer Stores) In our rehabilitation unit, we often have clients who speak English as a second language. I have developed some simple materials in Polish, Greek and Italian that I use regularly. The Talk Now language teaching software series is also useful to provide additional support for ESL clients with aphasia. |
| **6** REACT Software | (Multimedia Speech Pathology, 43 Windsor Street, Kingston Beach TAS 7050, Ph: (03) 6229 3579 Fax: (03) 6229 3579) The clinic has purchased a number of other software resources over the years with varying success. The REACT software available through Multimedia Speech Pathology has proved of most value, with a range of activities and levels. |
| **7** Cervical auscultation | Cervical auscultation is for me the most valuable additional tool in bedside clinical evaluation. Julie Cichero has pioneered this technique in Australia and her workshop “Who’s afraid of the stethoscope?” was great. |
| **8** Previous clients | Evaluating dysphagia is one thing, swallowing rehabilitation is quite another. Some years ago I had a patient with bilateral lower motor neuron damage to the IX, X, XI and XII cranial nerves. Not only is she alive, but, after heaps of exercise and boundless determination, she now tolerates a soft normal diet and thin fluids. Whenever a swallowing problem seems insurmountable, I remember her. |
| **9** Various instrumental techniques | Instrumental techniques I use in swallowing (and dysarthria) rehabilitation include Surface Electromyography (with huge thanks to Maggie Lee Huckabee and her excellent workshop); Continuous Positive Airway Pressure (with the support of the Thoracic Medicine Department, RBH), and electrical stimulation (supported by the work and preparation I undertook for my own workshop). |
| **10** Collaboration | Finally, I value my ongoing contact with the University of Queensland. Staff and students from a range of departments including physiotherapy, psychology and chemical engineering have supported me in a range of research projects and their help has been invaluable. |
ACQ Notes to Authors

ACQuiring Knowledge in Speech, Language and Hearing is a major publication of Speech Pathology Australia and provides a professional forum for members of the Association. Material may include articles on research, specific professional topics and issues of value to the practising clinician, comments and reports from the President and others, general information on trends and developments, letters to the Editor and information on resources. Each issue of ACQ aims to contain a range of material that appeals to a broad membership base. ACQ is published three times each year, in February, June and October.

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* articles on other topics are also welcome

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