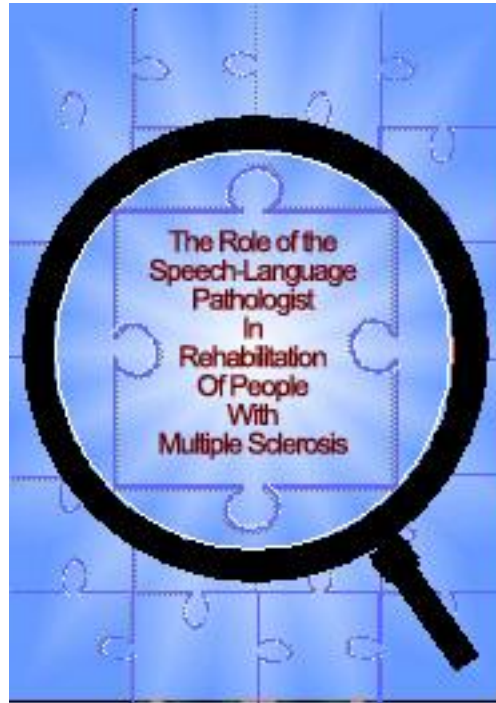


The Role of Speech - Language Pathologist in Rehabilitation of People with Multiple Sclerosis

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The Speech and Language Department of the National MS Centre welcomes daily 100 PwMS and organizes stages for students coming from 4 High schools and 6 Universities. The team organizes regularly study days for health care professionals, students and family members. Since 1976, the department developed more specifically the rehabilitation of respiratory function (Intrapulmonary Percussive Ventilation), dysarthria (acoustic analysis), swallowing disorders and high level language deficits. Each member has specific interests. **Guy Ganty** is Head, Chairman of the CCC on Communication and Swallowing Disorders of RIMS (Rehabilitation in MS) and member of the Editorial Board of MS in Focus (MSIF). **Antonella Nota** is also computer scientist and teacher. **Muriel Lafortune** is also Orthoptist. **Anne Vandevijver** is specialized for myofunctional rehabilitation. **Sarah Vanlievendael** is Speech-Language Pathologist is specialized for severe MS pathologies.



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CONTENTS

Introduction	5
Dysarthria	6
<i>Introduction</i>	<i>6</i>
<i>Assessment</i>	<i>6</i>
<i>Management</i>	<i>8</i>
Respiratory dysfunction.....	11
<i>Introduction</i>	<i>11</i>
<i>Assessment</i>	<i>11</i>
<i>Management</i>	<i>11</i>
SWALLOWING DISORDERS.....	13
<i>Introduction</i>	<i>13</i>
Disorders affecting the oral phase	13
Disorders affecting the pharyngeal phase	14
Disorders affecting the esophageal phase	15
<i>Assessment</i>	<i>15</i>
<i>Management</i>	<i>16</i>
Adaptation of the food	16
Swallowing maneuvers	19
Conclusion.....	20
LANGUAGE DISORDERS.....	21
<i>Introduction</i>	<i>21</i>
<i>Assessment</i>	<i>22</i>
Naming.....	22
Narrative discourse	22
Sentence comprehension.....	24
Word fluency	24
HLL abilities	24
<i>Management</i>	<i>26</i>
Appendix - Intrapulmonary Percussive Ventilation (IPV®).....	35
Introduction.....	35
1.1 Intended use	35
1.2 Theoretical aims of IPV®	36
1.3 Indications.....	36
1.4 Contraindications	37

Introduction

The need for speech and language rehabilitation in people with multiple sclerosis (MS) is still under-recognized. Indeed, few European and American rehabilitation centers offer the services of a speech-language pathologist for complete assessment and therapy of communicative and swallowing disorders.

Communication problems affect both expression and understanding, and therefore directly affect the individual's psychosocial well being. Expression can be altered by motor and sensitive dysfunctions that induce dysarthria (articulatory and respiratory disorders). Swallowing disorders should be detected and managed promptly to help patients maintain an optimal quality of life. Appropriate therapy includes teaching compensatory techniques, as well as providing information, e.g., how to modify meals, to patients, family, and caregivers.

Linguistic performance can also be influenced by cognitive problems. Recent studies demonstrated that when specific, sensitive language tests are used in patients with MS, results reveal problems with naming, narrative discourse, comprehension of concepts requiring logico-grammatical operations, repetition of sentences and digits, word fluency, verbal explanation, verbal-reasoning, reconstruction of sentences, definition of words, and interpretation of absurdities, ambiguities, and metaphors.

The primary role of the speech-language pathologist lies in facilitating the active participation of the patient in his or her daily and professional activities. Learning compensatory strategies and modification of the environment minimize handicaps and communication disorders.

Dysarthria

Introduction

Dysarthria is a collective name for speech disorders due to disturbances in muscular control of the speech mechanisms resulting from impairment of any basic motor processes involved in the execution of speech. (1) Although dysarthria occurs at varying stages of MS, it is generally uncommon during the initial stages of the disease. Paroxysmal motor speech disorders, on the other hand, have been reported as initial symptoms as well as throughout the course of the disease. Patients may experience slurred speech for a few seconds, remitting and reappearing for an additional few seconds. These attacks may occur a few times a day or several times an hour.

The prevalence of dysarthria in patients with MS is a matter of some controversy, depending on the type of professional assessment performed. Not surprisingly, although neurologists detect dysarthria in about 20% of patients with MS, speech-language pathologists identify subtle signs in about three times as many patients. (Table 1). (4)

Assessment

Several researchers have described specific deviant speech dimensions that can be tested and measured. Quantifiable tests assess respiratory and phonatory functions, motor performance, articulation, prosody, and intelligibility, and provide useful information concerning speech production.(1-3)

Table 2 summarizes the 10 most deviant speech dimensions.(4) Other perceptual dimensions(1) are also involved and require clinical investigation of each speech mechanism subsystem (respiratory, laryngeal, velopharyngeal and articulatory) to determine the underlying

basis of the disordered speech production. Subclinical assessment can identify subtle signs of motor speech impairment before they become clinically apparent. (4)

The early basic assessment includes a functional evaluation of respiratory function and a clinical examination of the motor, sensitive, and reflex aspects of the cranial nerves: trigeminal, facial, glossopharyngeal, pneumogastric, spinal, and hypoglossis. All movements are evaluated for muscle tone, force, amplitude, speed, and precision. Phonatory dimensions are defined during vocalization and current speech. Imprecise articulation and temporal aspects of speech production are assessed during repetition of words/sentences and repetition of syllables under control of a metronome. A questionnaire for the partner or the family can elicit information about intelligibility and the impact of fatigue on communication.

Acoustic Methods

Acoustic analysis provides an interface between speech production and perception and may be used to identify three classes of subclinical manifestations of dysarthria:

- Temporal characteristics: length of syllables, segments, sub-segments (vowels, formantic transitions, occlusion, transitory phase of explosives)
- Spectral characteristics: distribution of the energy according to the axis of frequencies (width of formants band, fricatives specter...)
- Phonatory characteristics: investigation of the glottic wave (fundamental frequency, variations in frequency, time and amplitude by cycle, relations between periodic and aperiodic energy)

Management

Rehabilitation for dysarthria should be initiated as early as possible and should involve both the patient and family. Most exercises require the patient's cooperation and should be planned according to the individual's cognitive abilities and level of fatigue.

Vocal efficiency

1. To reduce vocal fold adduction (high muscle tone):

Before starting vocal training, a reduction of muscle tone for a short period can improve laryngeal efficiency. According to the type (alpha or gamma) and grade of hypertonia, cryotherapy, tridimensional cycloid vibration, or transcutaneous neurostimulation may be used. During and after this stimulation, use of techniques such as the chewing method, gentle voice onset, oral resonance and projection, and phonation at high lung volumes will improve abduction.

2. To increase the vocal fold adduction (low muscle tone):

Postural adjustment of the head, pushing, pulling, and lifting exercises performed simultaneously with phonation, hard glottal attack, and higher pitch will improve adduction but may also induce fatigue.

3. To improve phonatory stability, breath control exercises, correct phonation initiation, and maximum duration vowel phonation may be employed.

4. To improve phonatory coordination (metronome), accentuated rhythmic phonation at various tempos may be used.

If possible, visual and/or auditory feedback (Visipitch, Speech Viewer, Computerized Speech Lab) for pitch, intensity, and vocal duration will increase rehabilitative efficiency .

Velopharyngeal and resonatory stimulation

1. Palatal massage during production of non-nasal sounds increases awareness.
2. Icing and/or tridimensional cycloid vibration decrease the hyper-reflexia of velar muscles.
3. Articulation and oral resonance may be improved by stimulation of back-tongue position.
4. Patients should practice speech tasks during delivery of a CPAP (Continuous Positive Airway Pressure) through a nasal mask to the nasal cavities.

Articulatory stimulation (motility and coordination)

1. Regulation of muscle tone contrasts (relaxation vs increasing speaking effort)
2. Improvement of muscle strength by isotonic and isometric stimulation (caveat: do not exceed groups of 10 repetitions to avoid fatigue)
3. Precision of movements in direction and time (metronome)
4. Progression from short, easy speech units to longer units that include more utterances
5. Intelligibility and contrastive exercises

Prosodic aspects

1. Differentiation of two or more components by varied stress patterns
2. Contrastive intonational exercises
3. Improvement of breath group capacity
4. Rate control (metronome, rhythmic cueing)
5. Appropriate breath and phrasing patterns

Communicative interaction strategies for the patient and his/her interlocutor

1. Identify context and topic of conversation (pointing to first letters of the word on an alphabetic board)
2. Indicate preference for quiet discussion; reduce noise level
3. Ask for clarification
4. Summarize content and identify missing information
5. Push on diaphragm during expiration
6. Avoid long discussions
7. Utilize short sentences, modify content
8. Favor simple answers-- yes or no
9. Use speech/lip reading to supplement comprehension
10. Adopt a correct posture and maintain eye contact
11. Involve the patient in the conversation
12. Sprinkle explosive situations with a dose of humor

Augmentative communication strategies

Augmentative communication strategies (eg, Mind Express, Lightwriter, Delta Talker ...) should be introduced early, before neurological and cognitive dysfunctions limit the individual's ability to effectively utilize a device. Due to the progressive nature of MS, implementation and maintenance of the augmentative communication system require flexible and immediate responses to the patient's changing needs.

Respiratory dysfunction

Introduction

Respiratory dysfunctions are common in MS, occurring in more than 70% of patients(1, 4) and affect 52% of recently diagnosed MS patients.(5) Due to progressively declining motor efficiency and uncomfortable positions, restrictive symptoms reduce vital capacity, inspiratory and expiratory flows, and maximal voluntary ventilation. Persons with MS often present with obstructive pathologies, such as bronchitis and aspiration, that deteriorate with disease progression. Respiratory dysfunction affects:

- level and variability of pitch and loudness
- voice – voiceless contrast
- intonation
- sentence length

Assessment

Assessment should include:

- Clinical evaluation of sternocleidomastoïd, trapezius, deltoid, intercostal, and abdominal muscles
- Respiratory functional evaluation: vital capacity, flows, peak flows, maximal voluntary ventilation
- Chest radiography

Management

Early symptomatic and asymptomatic respiratory treatment limits the neurological effects of MS and protects the patient from the effects of aspiration. Treatment also improves the recovery of vocal dimensions, the realization of correct utterances, and the preservation of efficient communication patterns.(6)

The therapist should first help the patient achieve optimal posture and should provide information about normal respiratory processs and monitoring skills. As soon as possible, the

therapist may initiate ventilatory training (Intrapulmonary Percussive Ventilation, I.P.V; see Appendix), active and passive mobilization of the chest and arms, and reverse pedaling to improve lung capacity.

The following common breath control exercises are useful at home:

- Maximum phonation and speech tasks of increasing length performed on one breath
- Appropriate breath patterning (rapid intake of air followed by long controlled exhalation)
- Transfer of respiratory effort to the abdominal region.

Instruments such as InspirX “TM”, Triflo II “TM”, DHD Coach “TM”, Therapep “TM”, U tube manometer, and glass and straw are motivating and can provide excellent feedback. During long conversations, abdominal support increases subglottal pressure and reduces fatigue.

Intrapulmonary Percussive Ventilation (I. P.V.)

Intrapulmonary Percussive Ventilation of the lungs is a therapeutic concept advanced by Bird for the acute or chronic care of patients with respiratory dysfunction. I.P.V. delivers high flowrate mini-bursts of air into the lungs through an open circuit. The system transforms small volumes at high pressure and low flow into large volumes at low pressure and high flow (Venturi effect). I.P.V. follows the physiological movements of breathing, is not tiring, can be used during long sessions, and can be adapted for each patient. (6) (See Appendix for further information.)

SWALLOWING DISORDERS

Introduction

Swallowing disorders significantly affect patients' quality of life. Eating and drinking are not purely functional activities. Meals provide the context for important social interactions and represent a major part of daily life. Eating and drinking problems, therefore, will not only have physical consequences but will also quite clearly have a social and emotional impact on patients. Swallowing disorders may also negatively influence speech and communication.

Initially, people with MS have only minor swallowing problems and generally do not report them easily. Ironically, early therapy can prevent difficulties later on during the course of the disease. The swallowing team seeks solutions that offer an appropriate balance between limitation of risks and maintaining quality of life.

Swallowing disorders may be characterized as affecting the oral phase, the pharyngeal phase, or the esophageal phase. (10)

Disorders affecting the oral phase (4, 7, 8, 9)

- Insufficient activation of the swallowing center in the brain stem as a result of loss of the senses of smell and taste
- Dribbling and excessive salivation as a result of weak labial closure, delayed or a slow swallowing frequency, and/or reduced oral sensitivity
- Manifestation of primitive oral reflexes (bite and suck reflex)
- Hypersensitive gag reflex
- Problems with the forming of a bolus as a result of labial closure and/or reduced tension and movement of the lingual, oral, and mandible musculature

- Chewing problems as a result of reduced tension and movements of the lingual, oral, and mandible musculature
- Problems with transport of the bolus by reduced tension and movements of the lingual, oral, and mandible musculature.
- Food remnants fall between the tongue and the mandible during mastication as a result of reduced tongue movements and/or reduced oral sensitivity
- Aspiration:
 - As a result of reduced tongue movements, the tongue is not able to collect the food.
 - As a result of reduced oral sensitivity, the bolus may fall over the base of the tongue before the swallowing reflex is triggered.
 - As a result of reduced closure of the velopharyngeal port, food may enter into the nasal cavity.

Disorders affecting the pharyngeal phase (4, 9)

- Reduced or absent swallowing reflex: risk of aspiration
- Insufficient protection of the larynx: food remnants may fall into the airway as a result of reduced elevation of the larynx and reduced closure of the airway
- Sensitivity problems in the larynx: food remnants may fall into the airway due to lack of a cough reflex (silent aspiration)
- Weak or absent peristalsis: the bolus is insufficiently transported
- Cricopharyngeal dysfunction: the sphincter of the esophagus does not relax when:
 - The bolus reaches the esophagus
 - There is a coordination problem between the contraction of the pharynx and the relaxation of the sphincter.

Disorders affecting the esophageal phase (4, 9)

- Reduced esophageal peristalsis
- Reflux: food remnants are pushed upwards by spasms in the esophagus against the sphincter. Food remnants may enter the pharynx, potentially resulting in aspiration.

Assessment (7, 8)

The assessment of swallowing disorders requires a multidisciplinary team approach.

- Neurologist: Checks the cranial nerves and brain structures--efficient swallowing requires cooperation and coordination of the cranial nerves. Lesions in the brain stem can affect single or multiple cranial nerves, potentially causing swallowing problems of various types. Spasticity, ataxia, and weakness of the muscles may cause movement problems of the muscles involved in swallowing.
- Otorhinolaryngologist: Checks the anatomy and physiology of all structures involved in swallowing
- Radiologist: Uses videofluoroscopy and/or endoscopy to identify problems and to determine when they occur. In most instances, this is done in conjunction with a speech-language pathologist.
- Speech –Language Pathologist: Observes swallowing during the meal; evaluates the influence of different sorts of food and posture on swallowing; checks the influence of adaptations; evaluates motricity, sensibility, reflexes, and the evolution of the swallowing problems
- Dietician: Supervises a balanced diet
- Occupational Therapist: Evaluates and advises about adaptations (cutlery, etc)

- Physiotherapist: Evaluates posture and motricity

Management (2, 3, 4, 7, 8, 9)

The goal of therapy in people with MS is to maintain the highest degree of swallowing ability possible, to prevent or eliminate aspiration, and to maintain adequate nutritional status. To achieve this, swallowing therapy is not always necessary. Instruction and advice for the patient, the caregiver, and/or the family, may be adequate.

Essentially, treatment consists of compensation techniques and/or exercise programs. Exercise programs can focus directly or indirectly on the swallowing process.

Indirect treatment aims at correction of neuromuscular functions in the oral area, and the stimulation of sensibility and reduction of pathological reflexes.

Direct treatment might consist of assisting the transition from tube feeding to oral feeding, for example, by using Cycloidal Vibration Therapy (C.V.T.) to stimulate the chewing reflex and activate the swallow reflex (see previous section on voice disorders), or with ice bags stimulation (2, 3).

Weakness, fatigue, disturbed mental state, as well as a lack of motivation, may be reasons to discontinue treatment.

The recommended posture during treatment and eating is to be seated upright with head and neck slightly flexed.

When swallowing problems are too severe, tube feeding may be necessary. Tube feeding is inevitable when the risk of aspiration is significant or when nutrition is inadequate.

Adaptation of the food (5, 6, 7, 9)

Different consistencies

Offering food with different consistencies increases the risks of aspiration. Liquids, for instance, can be correctly swallowed, whereas solid food may remain stuck in the posterior side of the mouth. After a while, food remnants can penetrate into the pharynx, provoking aspiration after swallowing. Or, some liquid may overflow into the pharynx before the swallowing reflex starts, leading to aspiration before the swallowing act. Additionally, any time solid food passes in an uncontrolled way, the patient may choke.

Sticky food

Patients who have problems with their tongues, as well as decreases of sensibility, may be unable to control food particles that fall on both sides of the tongue, teeth, palate and pharynx. These particles may split up after some time. Since they are too small to provoke the swallowing reflex, they can penetrate into the pharynx and /or the airways.

Crumbly food

Sometimes it is more difficult to generate a homogeneous food bolus with crumbly food, which may split into small fragments that remain stuck in the mouth. These food particles represent a danger, since they can penetrate the pharynx in an uncontrolled way, provoking aspiration before or after swallowing.

Solid food

Solid food presents problems with chewing for patients having a decrease of oral motricity, an incomplete set of teeth, or artificial teeth. Chewing problems prevent the elaboration of a homogeneous food bolus, which can become unverifiable, penetrating into the pharynx. The patient will choke *before* the swallowing act. In contrast, after the swallowing act, small

remaining particles of food can penetrate into the pharynx and/or into the airways. This is aspiration *after* the swallowing act.

Semi-solid food

For patients with MS, semi-solid foods present fewer problems in terms of aspiration and are advised for patients with:

- A weakness of laryngeal protection or a delayed swallowing reflex
- Reduced oral motricity, with chewing problems.

Liquids

Simple liquids are more likely to be inhaled than thicker liquids. A decrease in oral motricity also contributes to the likelihood of liquid being inhaled into the pharynx.

Other factors important in the prevention of aspiration include:

- Temperature--warm or cold drinks stimulate* the swallowing reflex better than tepid drinks.
- Flavors-- play a stimulatory* role.
- Carbonation—stimulates* nerve extremities and the swallowing reflex more readily than than mineral water.

Conclusion

All types of foods can cause difficulties. It is important to verify, therefore, the level of difficulties likely to be encountered by each patient. The severity of the problem will determine the type of treatment. In cases of mild or moderate aspiration risk, the patient and family/caregivers must pay close attention. In cases of severe risk, it is important to avoid problematic food categories. Table 3 presents “Tips for Successful Meals.”

**Caution:* Hyperstimulation can provoke cramps.

Swallowing maneuvers

The following swallowing maneuvers aim to modify some aspects of the physiology of swallowing. Since it is important that patients participate actively in these maneuvers, it is important that they be mentally capable of understanding instructions. These procedures should be verbally explained before any attempts are made to practice with food.

Supra-glottic swallowing or protection of the airways

The patient should be instructed to inspire and block breath to close airways before and during the swallowing act. After swallowing, the patient should cough to evacuate any food particles in the pharynx. This maneuver is particularly advisable for patients at risk of aspiration during swallowing. It can also be applied for patients who are at risk of aspiration before and after swallowing.

Effortfull swallow

The patient is instructed to swallow with more force. In this way, the propulsive force of the tongue will be greater and the contraction of the posterior side of the pharynx will increase. This maneuver is particularly applicable for patients who experience decreased propulsive force of the tongue and a decrease of the motricity of the anterior side of the tongue.

Double swallow

The presence of residues at the level of the pharynx will be decreased if the patient is instructed to swallow several times. This procedure decreases risks of aspiration after the swallowing act.

Mendelsohn maneuver

The purpose of Mendelsohn's maneuver is to obtain maximal extension at the level of the larynx, as well as an elongation of the crico-pharyngeal opening time, in order to protect the larynx. This maneuver is indicated for patients who present with a decrease of the laryngeal elevation, as well as for patients having problems of coordination between the arrival of the food bolus and the opening of the crico-pharyngeal sphincter.

Tube-feeding

Tube feeding can be either a temporary or a permanent solution to swallowing dysfunctions. The use of a nasogastric tube is generally appropriate for temporary situations. If the patient needs long-term nutritional support, non-oral feeding may require a gastrostomy. Tube feeding is not, however, a contraindication for oral feeding. Tube feeding can be used to compensate for certain nutritional conditions or treat deficiencies, as a main feeding system, or just for liquids.

Conclusion

Dysphagia occurs quite frequently with MS (58%), although videofluoroscopy in one series (Herrera et al. 1990) (11) showed abnormal swallowing in 96%, aspiration in 28% , poor oral stage in 50%, and delayed swallow trigger in 70%. After a swallowing problem is detected, regular evaluation by an interdisciplinary rehabilitation team is very important because MS is a degenerative neurologic disease. With regular treatment and follow-up, swallowing function can be maintained as well as possible. Time must be taken to educate the patient and his or her family, and necessary changes in the environment should be made to allow utilization of optimal strategies that will improve swallowing function.

LANGUAGE DISORDERS

Introduction

Some researchers have documented the presence of language dysfunction occurring early in the disease course (**Friedman, Brem, Mayeux, 1983**) (5), but research into communication problems of individuals with MS has tended to concentrate on the motor aspects of speech rather than on the possible language problems resulting from subcortical white matter demyelination. Research on language disorders in MS seems to have been limited to neuropsychological rather than linguistic assessments, especially High Level Language (HLL), ie, the ability to use multiple areas of complex linguistic and cognitive processing (**Rao 1986**)(5).

Impairment of memory and attention can be expected to affect basic language processes, whereas problem-solving deficits may affect HLL processes (**Uomoto 1991**) (1). Detection of HLL deficits has received increasing attention during the last 10 years (**Lethlean et Murdoch 1993, 1994, 1997**) (4). The relationship between language and cognition has attracted much debate, which centers around the question of whether impaired cognition results in impaired language abilities. In 1991, **Kennedy & De Ruyter** (1) summarized many of these arguments and determined that, although language impairment does not necessarily result from impaired cognition, every aspect of language requires cognitive processing, and an interdependent relationship exists between the two. Neuropsychological assessment batteries that incorporate language subtests may nevertheless fail to identify complex and/or subtle linguistic deficits in individuals with MS.

➔ **None of the language difficulties were detected by standard aphasia tests**

The more obvious aphasic syndromes are not commonly present in MS (Crosson, 1996) (4). Individuals with MS suffering from subtle deficits in verbal expression may exhibit difficulties in conveying their thoughts and needs to others (Crosson, 1996) (4).

Assessment

The success of verbal discourse is dependent upon such factors as lexical, grammatical, pragmatic, and cognitive competencies (Dennis and Lovett 1990) (1). The speaker needs to be able to store events in memory, integrate new and existing knowledge, and retrieve this knowledge (Terrell & Ripich 1989) (1). Some of the following language problems have been identified among individuals with MS (Beatty, Goodkin, Monson, Beatty & Hertsgaard , 1988) (5).

Naming

- Naming deficits in MS have been attributed to inefficient patterns of semantic memory search resulting from impaired access to semantic memory (Beatty, Monson, Goodkin, Caine et al, 1986) (6).
- MS may be associated with an accessing deficit, i.e., an inability to retrieve the appropriate word from the lexicon, rather than a breakdown of semantic knowledge, as identified in Alzheimer's Disease (Smith et al, 89 ; Troster, Salmon, Mc Cullough, & Butters, 89) (6).
- Individuals with Relapsing Remitting and Chronic Progressing MS had significantly lower Boston Naming Test scores than those in the control group. (6)

Narrative discourse [The author is including data from a study without identifying the study (1)

- Deficits of language and naming are expected to affect tasks such as narrative discourse, which require a high degree of cognitive linguistic interchange.

- Narratives produced by people with MS proved to be significantly different from the narratives of non-MS subjects, when measures of core propositions were compared. (1)
- Patients with Chronic Progressive MS performed significantly more poorly than control subjects, although their performance did not differ significantly from those with Relapsing Remitting MS. (1)
- Although people with MS used approximately the same number of words and ideas and the same basic story framework as control subjects, they failed to provide as much information considered essential to the story as those without MS. Moreover, there was a trend towards the use of more redundant information among individuals with MS than in the control subjects.(1)
- Analysis of response profiles indicates that group differences with respect to measurement of core propositions may be partly caused by a lack of inferred information in the narratives. MS may be linked to an inability to process inferred information.
- Inferred information relies on the higher cognitive function of abstract reasoning to utilize clues such as facial expressions, physical distance, body posture, and physical setting to make appropriate inferences (**Bisset & Novak, 95**) (1).
- Studies highlight a pragmatic disturbance, that is, the speaker's failure to take the listener's perspective into account. On a more global level, executive planning skills, together with pragmatic skills, allow the individual to determine the communicative needs of the situation, and to meet those needs. Therefore, at a conceptual level of discourse processing, a complex interplay of cognitive and pragmatic processes results in the formulation of appropriate message meaning.(1)

Sentence comprehension

- Deficits became apparent when people with MS attempted to understand semantically non-constrained sentences with subordinate phrases or sentences in the passive voice. **(3)**
- Grossman M. & al (1995) (3) speculate that slowed information processing speed may account for some of the sentence processing deficits seen in MS.
- **Dennis et Barnes** (1990) (7) suggested that if an individual has a poor working memory--especially in accessing information from primary memory (**RAO et al, 1989b**)--as may occur in MS, comprehension of text and situation will continually be overtaxed because even familiar situations must be constantly understood anew.

Word fluency

- Subjects with Relapsing Remitting and Chronic Progressive MS perform more poorly on word fluency tasks than control subjects. (**Beatty et al 1988, 1989; Heaton et al, 1985, Jennekens-Schinkel & Sanders , 1986**)(5)
- Impaired initiative and spontaneity, impaired working memory, and attention difficulties are all extralinguistic factors that may interfere with the speed and efficiency of completing a word fluency task (**Chertkow & Bub,1990**) (5).

HLL abilities (Lethlean & Murdoch,1997)(7)

- The **Lethlean & Murdoch** (7) study results showed that individuals with MS performed significantly less well than subjects in the control group on measures of HLL abilities including naming, the comprehension of concepts requiring logico-grammatical operations, repetition of sentences and digits, word fluency, and subtests requiring verbal explanation, verbal-reasoning, reconstruction of sentences, definition of words, and interpretation of absurdities, ambiguities, and metaphors.

- According to Wiig and Secord (1985) (7), low overall scores achieved on The Language Competence (TLC) test by those in the MS group reflect divergent difficulties in language production, impaired planning, problem solving and cognitive-linguistic inflexibility.
- Anzola et al. (1990) (7) also have reported inferior performance among those with MS on tasks of abstract reasoning, concept formation, and verbal memory.
- The control group performed significantly better than subjects with MS on the recreating sentences subtest of the TLC. (7)
- The MS group produced sentences that were awkward, incomplete, and or semantically, pragmatically, and syntactically inconsistent (7)
- Those with MS had difficulty understanding ambiguous sentences in the TLC and determining two meanings for each sentence. They were able to identify a single interpretation of the sentence, but even with prompting, failed to evaluate, plan, and process a second meaning. Others simply made no attempt to formulate another response or a response with similar meanings.(7)
- The performance of those in the MS group on the metaphor subtest of TLC was not as competent as the performance of those in the control group. Subjects with MS made more errors.(7)
- The performance of subjects with MS as a group may reflect poor verbal explanation abilities because performance improved when they were required to match metaphoric expressions with those having the same underlying meaning. (7)
- Explaining ambiguous sentences, metaphors, associations, and sentence absurdities all require verbal reasoning abilities (Jorgensen et al, 1981). According to Jorgensen et al., explanations in response to The Word Test tasks demonstrate verbal reasoning skills and the ability to express knowledge of the critical semantic attributes in a given category.

Some subjects with MS had difficulty verbalizing the reason the selected item did not belong to the category. Others selected an incorrect word and provided an inadequate reason for why the item was selected (7).

Management (Murdoch & Theodoros, 2000) (8)

The goals of treatment will depend on the communicative demands, the available support, and the cognitive-linguistic limitations experienced by the person with MS. Treatment should be planned with a full understanding of what is socially valid and meaningful both for the patient and the significant people in his or her life. Different treatment approaches are used to target different levels of function and to achieve different levels of defined goals. Component process retraining can be used to target immediate goals with the aim of ameliorating specific cognitive-linguistic impairments (identified through standardized testing) that form the underpinning of the functional communication disorder. Component process retraining often utilizes hierarchically organized word-book type activities that target higher-level linguistic, metalinguistic, and pragmatic operations.

Treatment may include individual or group exercises targeting:

- Lexical-semantic skills, such as word retrieval, identifying synonyms and antonyms, semantic choice questions, defining words by class, defining using negation, matching words by definitions, defining words...
- Auditory processing, such as comprehension of spoken instructions, comprehension of lengthy or complex auditory information...

- Comprehension of complex written information, such as identifying and explaining absurdities that arise from contextual incongruence, recognizing alternative interpretations of information...
- Organization of written expression, such as sequencing tasks, summarizing tasks, providing step-by-step written instructions, short narrative production...
- Organization of verbal expression, such as syntactic judgment tasks, story retelling, story generation, analysis, and self-correction of recorded verbal expression...

To attain goals that target certain functional skills, compensatory strategies and functional skills training can be used. Compensatory strategy training aims to teach the individual methods by which to overcome his or her deficits through the use of internal compensation. For example, the patient may be taught to use circumlocutions when frustrated by word retrieval deficits, or to ask for repetition or written information when he or she cannot understand detailed information.

Environmental manipulation can facilitate communicative success for the person with MS.

Intervention may include advising a potential communicative partner as to the best methods of interaction, or altering the physical layout of a work space so that the person with MS is able to operate with limited distractions and extraneous noise.

Conclusion

Cognitive functions are presumably influenced by language deficits. The ability to comprehend a word does, to some degree, influence the ability to encode items into verbal memory. Additional research and information regarding the type, nature, and frequency of language problems in individuals with MS will increase awareness of possible language problems in this population and may result in more effective approaches to rehabilitation. Recent results underscore the need

for researchers and clinicians to use more sensitive language assessments--compared with those used in previously reported studies--to accurately quantify and describe the linguistic abilities and deficits experienced by people with MS.

Awareness of the presence of mild language deficits in individuals with MS is particularly important for speech-language pathologists involved in the rehabilitation of young people with the disease. Clinicians are reminded to ask their patients with MS about subjective language difficulties.

Identification of people with MS who present HLL difficulties will then enable clinicians to develop and make available rehabilitation strategies aimed at maximizing language skills.

If subtle language deficits are detected, language intervention can begin at an early stage.

TABLES

Table 1. Prevalence and severity of dysarthria in MS (4)

Examination	Prevalence		
Neurologist	20 %		
Speech-Language Pathologist	Perceptual evaluation	51 %	62 %
	Subclinical signs	11 %	

Table 2. Ten Most Deviant Speech Dimensions (4)

Imprecision of consonants	92 %
Glottal fry	88 %
Prolonged intervals	87 %
Harshness	86 %
Impaired stress pattern	83 %
Inappropriate loudness level	81 %
Impaired overall intelligibility	78 %
Impaired respiratory support	77 %
Impaired rate	74 %
Impaired pitch variation	69 %

Table 3. Tips for Successful Meals

- Prepare a quiet environment
- Ensure that the patient is able to breathe freely through the nose. Clean the nose if necessary.
- Check to make sure that any artificial teeth are well fixed.
- Don't place too much food on the spoon.
- Use normal "cutlery" (not too deep, not too pointed). If necessary, use adapted cutlery, anti-skid rimmed dishes in coordination with the occupational therapist.
- If possible, use normal drinking utensils, preferably not a mug with a spout, because it does not stimulate lip rounding sufficiently.
- If hand function is limited, straws can be used, but only if lip sealing is sufficient (in order to avoid the intake of air, which encourages aspiration). Straws must be avoided when the bite reflex is present. Shorter straws may be easier when patients experience sucking problems.
- When assisting a patient, make sure to maintain eye contact; don't stand up, as this could result in the patient extending the neck.
- Allow enough time for eating and drinking.
- Don't offer the next spoonful or sip too soon. Wait for the patient to swallow. This can be monitored by watching the movement of the larynx. Clear the mouth of any residues.
- Present the food while facing the patient. Make sure that the spoon or fork is placed straight in the mouth (to stimulate the paralyzed side); if necessary, some pressure on the tongue may be used. Encourage the patient to take the food in his mouth and take the spoon or fork straight away from the mouth. Do not clear against teeth or lips.
- Take care that the patient's lips are sealed during chewing or swallowing (assist if necessary).

- If necessary, use a dish with a compartment for hot water (or reheat food in the microwave). Cold food is tasteless, is difficult to eat, and does not provide enough stimulation. If necessary, dab--rather than wipe--the patient's mouth.
- Preferably, do not offer a beverage to clear or rinse the mouth. It increases the probability of aspiration.
- Do not ask the patient questions while he is eating, although you may give short instructions.
- In case of aspiration, encourage the patient to cough up the food (eventually, use the Heimlich maneuver). Do not continue feeding if respiration is not regular. If the swallowing reflex remains absent, you may exercise some pressure underneath the chin (mouth control).
- In case of fatigue, patients may do better by eating smaller portions more often, and resting before eating.
- The patient should clear his throat regularly.
- The patient should remain seated upright for 15 minutes after eating.
- Give one medication at a time, with a spoon.
- Pay attention to oral hygiene.
- Sometimes, artificial teeth do not fit well anymore because of changes in the mouth. Special adhesives can be useful. If not, consult a dentist.
- It is important to pay attention to the way meal is served. The patient has to enjoy it. Smell and taste should be stimulated because they increase sensibility of the mouth.
- Some simple ways to preserve smell and taste are:
 - steaming and grilling food
 - use of light sauces
 - varying food

- use of spices
- serving foods at the right temperatures

References

Dysarthria & Respiratory Dysfunction

1. Darley F.L., Aronson A.E., Brown J.R, (1975) – Motor Speech Disorders, W.B. Saunders Company, Philadelphia – London - Toronto
2. Assessment of Intelligibility of Dysarthric Speech (Yorkston & Beukelman, 1981)
3. Frenchay Dysarthria Assessment (Enderby, 1983)
4. Hartelius L. (1997) – Acoustic and perceptual analysis of dysarthria associated with multiple sclerosis, Dissertation from the department of Logopedics and Phoniatrics, Sahlgrenska University Hospital, Göteborg, Sweden
5. Murdoch B. & Theodoros D. (2000) - Speech and Language Disorders, Multiple Sclerosis, Whurr Publishers, London - Philadelphia
6. Ketelaer P., Prosiegel M., Battaglia M. & Messmer Uccelli M. (1997), A Problem-Oriented Approach to Multiple Sclerosis, Respiratory dysfunction in multiple sclerosis (288-299), Voice disorders (300-303), Dysarthria in multiple sclerosis (304-312), Acco, Leuven, Belgium

Swallowing Disorders

1. Buchholz D. (1994) Neurogenic Dysphagia : What is the Cause When the Cause is not Obvious? *Dysphagia*, 9, 245-255.
2. de Grauw M.F. (1995) Lesstof : eet- en drinkproblemen, *Logopedie en Foniatrie*. 3, 79-83.
3. Ganty G., Hallet D., Ketelaer P. (1983) Traitement de la dysphagie haute. Rapport préliminaire. *Revue des Séminaires Belges de Réadaptation*, 3, 33-48.
4. Goeleven A. , M. D'Hondt, I. Muyltermans, (1991) Verworven slikstoornissen bij volwassenen. Thesis St-Vincentius, Gent, Belgium.
5. Groher M.E. (1994) Determination of the Risks and Benefits of Oral Feeding. *Dysphagia*, 9, 233-235.
6. Gustafsson B. & Theorell T. (1995) Adaptedness and Coping in Dysphagic Students. *Dysphagia*, 10, 86-92.
7. Ketelaer P., Prosiegel M., Battaglia M. & Messmer Uccelli M. (1997), A Problem-Oriented Approach to Multiple Sclerosis, Management of swallowing disorders in multiple sclerosis, Acco, Leuven, Belgium
8. Langley J. (1988) Working with Swallowing Disorders. Winslow Press.
9. Logemann J.A. (1983) Evaluation and Treatment of Swallowing Disorders. San Diego, College-Hill Press.
10. Miller A.J. (1986) Neurophysiological Basis of Swallowing. *Dysphagia*, 1, 91-100.
11. Herrera W., Zeligman BE, Gruber J., et al. (1990), Dysphagia in multiple sclerosis: clinical and videofluoroscopic correlations, *J Neuro Rehab*, 1990, vol. 4, 1-8

Language Disorders

1. Arnott W.L., Jordan F.M., Lethlean J.B. & Murdoch B.E., (1997) - Narrative discourse in Multiple Sclerosis: an investigation of conceptual structure , *Aphasiology*, Vol 11, No 10, 969-991

2. Friend K.B., Rabin B.M., Groninger L., Deluty R.H., Bever C., Grattan L. (1999) - Language Functions in Patients with Multiple Sclerosis, *The Clinical Neuropsychologist*, Vol 13, No 1, pp 78-94
3. Grossman M., Robinson KM, Onishi K., Thompson H., Cohen J., D'Esposito M., (1995) Sentence Comprehension in Multiple Sclerosis, *Acta Neurologica Scandinavica*, 92, 324-331
4. Laakso K., Brunnegard K., Hartelius L, Ahlsén E. (2000) - Assessing high-level language in individuals with Multiple Sclerosis: a pilot study, *Clinical Linguistics & Phonetics*, Vol 14, No 5, 329-349
5. Lethlean J.B. & Murdoch B.E., (1993) - Language problems in Multiple Sclerosis, *Journal of Medical Speech and Language Pathology*, Vol 1, No 1, pp 47-59
6. Lethlean J.B. & Murdoch B. (1994) Naming in MS : Effects of Disease Course, Duration, Age, and Education level, *Journal of Medical Speech and Language Pathology* , Vol 2, Number 1, pp 43-7
7. Lethlean J.B. & Murdoch B., (1997) Performance of subjects with Multiple Sclerosis on tests of high-level language, *Aphasiology*, Vol 11, No 1, 39-57
8. Murdoch B. & Theodoros D. (2000) *Speech and Language Disorders in Multiple Sclerosis*, Whurr Publishers

Appendix - Intrapulmonary Percussive Ventilation (IPV®)

Introduction

Definition and description of Intrapulmonary Percussive Ventilation (IPV®)

Designed by Bird (Percussionaire® Corporation, Sandpoint, Idaho, USA), (1) Intrapulmonary Percussive Ventilation (IPV®) is an instrumental mucus clearance technique. This therapy delivers a continuous and pulsatile gas flow (successive subtidal volumes) to the patient's airways, by means of an open breathing circuit called "Phasitron®" whose function is to convert low-flow high-pressure subtidal volumes into high-flow low-pressure subtidal volumes. In other words, the "Phasitron®" is a flow/pressure converter based on the Venturi principle associated with a pneumatic nebulizer. The circuit is a continuously-open breathing circuit. This translates to the genesis of a physiological waveform (the patient inspiratory time corresponds to a pressure decrease) and a low mean intrapulmonary pressure (always below 8 mbar), without causing any heart overloading or any major increase of the functional residual capacity.

1.1 Intended use

The Intrapulmonary Percussive Ventilation is intended for respiratory treatment:

- in institutions and patients' homes
- by qualified, trained personnel under the direction of a physician
- of adults, children, and infants using a mouthpiece, a facial mask or a tracheotomy
- of patients suffering from obstructive and/or restrictive pulmonary diseases
- for acute or long-term diseases

The Intrapulmonary Percussive Ventilation is not intended for any kind of life support ventilation.

1.2 Theoretical aims of IPV®

- The mobilization of peripheral secretions (bronchial and pulmonary) owing to the vibration (mechanical action) and the continuous flow.
- The recruitment of pulmonary alveoli by reventilating and resolving the atelectasis.
- The improvement of gas exchanges by the high flow delivered to the patient's airways (up to 40 liters/minute) and the alveolar molecular stirring, which, in turn, increases contact between oxygen molecules and the alveolo-capillar membranes.
- The work on the thoracopulmonary compliance.
- The peristaltic effect on the three pulmonary circulations (bronchial, pulmonary, and lymph circulations) induced by IPV® therapy at the vascular level
- The fight against preferential ventilation and intrinsic peep.
- Prevention of infection associated with long-term treatment.

1.3 Indications

Intrapulmonary Percussive Ventilation (IPV®) is indicated in the treatment of peripheral obstruction and respiratory disorders due to restrictive and/or obstructive pulmonary diseases. IPV® operates regardless of the level of patient cooperation and adapts instantaneously to the patient's intrapulmonary pressures. This technique can be used on all patient populations, in institutional or domiciliary care, for acute or long-term treatment.

The IPV® is optimized when combined and/or alternated with manual respiratory physiotherapy based on the modulation of volumes and flow, such as the Autogenic Drainage, the ELTGOL, assisted-cough, AFE, ACBT, or the AD.

1.4 Contraindications

The most important contraindication to IPV® is a non-drained pneumothorax. Relative contraindications are Lyell's syndrome, severe hemoptysis, blood crisis disorder, and anticoagulant treatment based on hypocoagulant dosis.

IPV® should always be followed by clearance of drained secretions using instrumental techniques or expiratory flow-increasing techniques. This is particularly important when the patient has an inefficient spontaneous cough.

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1. Kenneth Davis, Jr., M. Hurst, Richard D. Branson, (1989) - High Frequency Percussive Ventilation, Problems in Respiratory Care, Vol 2, N° 1, January-March 1989, , 39-47