



American Parkinson Disease Association

# SPEAKING EFFECTIVELY

*A Strategic Guide  
For Speaking  
and Swallowing*

AMERICAN PARKINSON DISEASE ASSOCIATION INC.



# **SPEAKING EFFECTIVELY**

## **A Strategic Guide for Speaking and Swallowing**



American Parkinson Disease Association

### **Bari Hoffman Ruddy, PhD, CCC-SLP**

Associate Professor

Department of Communication Sciences and Disorders

University of Central Florida, Orlando, Fla.

Director

The Ear, Nose, Throat and Plastic Surgery Associates Voice Care Center,  
Orlando, Fla.

### **Christine Sapienza, PhD, CCC-SLP**

Professor and Chair

Department of Speech, Language, and Hearing Sciences

University of Florida, Gainesville, Fla.

Movement Disorders Clinic, University of Florida,  
Gainesville, Fla.

Research Career Scientist – Brain Rehabilitation Research Center

Malcom Randall VA, Gainesville, Florida

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## INTRODUCTION

Changes in the ability to communicate may often occur in people who have Parkinson's disease (PD). These changes may result in social isolation and social withdrawal. Some individuals have described "the speech and voice difficulty as the most debilitating of their Parkinson's symptoms leaving them unable to effectively communicate, and in some cases, limiting employment opportunities." This booklet is intended to provide persons with PD, spouses, other family members, care providers, and friends with information on speech, voice and swallowing function related to PD. Information about the signs, symptoms, evaluation and the treatment process are discussed. Strategies or tools that are needed to effectively communicate in daily living activities are also included. Another purpose of this booklet is to emphasize and encourage persons with PD to seek early intervention for their speech, voice or swallowing difficulties from a certified speech-language pathologist, as restorative treatment options are available.

Sometimes the changes that occur in the voice, speech, and swallow system are the very first symptoms of the disease. In other individuals, these changes gradually appear as PD progresses. In many instances, the changes are subtle and often undetected by the individual with PD. But, just as a spouse or friend may be the first to notice reduced arm swing or altered gait, the same may be true for the changes that occur in speech and voice.

Some of the same physical symptoms that occur in the limbs (tremor, bradykinesia/reduced movement, and rigidity) can also occur in the speech, voice and swallowing systems. These changes are often referred to as a dysarthria. Dysarthria is a collective term used to refer to the impaired production of speech due to disturbances in the muscular control of the speech production and swallowing mechanism. Hypokinetic dysarthria is the term used to refer to the specific type of dysarthria we know as PD (a.k.a. Parkinson's dysarthria). The term "Hypokinetic" means reduced movement. Therefore, hypokinetic dysarthria is reduced movement of the muscles used for voice production and swallowing.

### **Neurological Basis For Voice And Speech Difficulty**

In general, PD is a slowly progressive neurological movement disorder caused by a degeneration of dopamine producing cells in the substantia nigra. The effects of PD can affect respiration (breathing), phonation (voice production), resonance (richness of voice), articulation (clarity of speech), and swallowing function. Disruptions to breathing, voice, speech and swallowing characteristics are caused by impaired movements of muscles, which are slower, less accurate, weaker or difficult to coordinate with other movements. The muscles of the lips, tongue, throat, larynx (voice box) and lungs may all be affected. The primary result of these changes in muscle performance includes imprecise articulation and rapid speech rate with progressive acceleration and short rushes of speech, reduced stress of syllables, reduced loudness, a hoarse, tremulous, monotone voice, impaired tongue movements, weak pharyngeal wall movements and/or difficulty directing food into the esophagus/stomach tube.

Practical suggestions for ways to improve eating ease and swallow safety are also included in this booklet. Excessive saliva production, drooling and hearing impairment are concerns for many people with PD. These problems also have an effect on communication. Practical ways of dealing with them are reviewed.

## **THE ROLE OF THE SLP IN EVALUATING AND TREATING PD**

There are many professionals that care for the person with PD. Speech-language pathologists (SLP) are healthcare professionals trained to evaluate and treat individuals with speech, voice, language, and swallowing problems. A SLP has a graduate degree and is certified by the American Speech-Language and Hearing Association (ASHA).

Developing and improving effective communication skills and swallowing function are the primary roles of a SLP when treating an individual with PD. Many SLP's have specialized training, specifically in treatment of the PD population.

### **Where Can I Find an SLP?**

Local hospitals and rehabilitation centers employ SLP's to provide both inpatient and outpatient services. In addition, many SLP's have private practices, and many university clinics specialize in treatment of PD.

ASHA may also help locate SLP's in specific geographic regions. ASHA can be contacted at:

American Speech-Language and Hearing Association ([www.asha.org](http://www.asha.org))  
10801 Rockville Pike  
Rockville, Maryland 20852  
Phone: (800) 498-2071  
Fax: (301) 296-8580  
TTY: (301) 296-5650  
Email: [actioncenter@asha.org](mailto:actioncenter@asha.org)

Also the Ellis Neurological Voice Treatment Foundation is dedicated to the education, research and training of SLP's in the treatment of neurological speech and voice disorders. This foundation maintains a roster of certified SLP's specifically trained in the Lee Silverman Voice Treatment for PD. Contact information is:

Ellis Neurological Voice Treatment Foundation  
P.O. Box 642  
Louisville, Colorado 80027  
Phone: (303) 604-3280

### **Evaluating Speech and Voice**

Healthy speech, voice, and swallowing production require that the brain and muscles that work the structures of the head, neck and pulmonary system are all functional. If a referral to a SLP is made, it is most likely that he/she will be working closely with an otolaryngologist (a physician who diagnoses disorders of the ear, nose and throat) or a neurologist (a physician who diagnoses and treats disorders of the nervous system). The SLP's job is to determine if there are problems with the way the structures in the oral cavity (tongue, lips, jaw etc)

are working to produce speech, voice and swallow. Questions about medical history will be asked and specific questions about the changes in speech, voice, or swallow following the onset of PD will need to be documented. Particular emphasis will be on how speech and voice quality has changed and what circumstances or situations make it get better or worse. Questions about changes to eating and nutrition will also be asked.

A SLP may perform an oral peripheral examination, to look at the structure and function of the lips, tongue, jaw and other parts within the mouth. Following the oral peripheral examination, the speech pathologist may perform an examination of the vocal cords. This is done in the physician's office and allows the medical team to determine if the vocal cords are moving normally.

The SLP is the person who will provide detailed information about the changes that will occur in speech, voice and swallowing as the disease progresses and will be able to offer solutions and treatment for improving speech, voice and swallowing if problems are being experienced.



## WHAT IS NORMAL?

### **Normal Breathing**

In order to breathe without effort the lungs, muscles of the ribcage, diaphragm and abdominal muscle all need to be healthy and function normally. Each of these parts makes up a big portion of the respiratory system. When air is taken into the lungs it is called primary inspiration or inhalation. To breathe-in, the lungs have to expand in volume. Movement of the diaphragm achieves this. When air is moved out of the lungs it is called expiration or exhalation. To breathe-out the lungs have to decrease in volume. Movement of the abdomen and the ribcage achieves this. When all parts of the respiratory system are functioning normally, the effort to breathe is minimal and automatic. When problems arise, the effort of breathing increases and this is when a physician should be consulted immediately.

### **Normal Voice Production**

Respiration (breath support) is often referred to as the “power-source” for voice production. When speaking, air must be brought into the lungs (inhalation). During exhalation, the air rushes through the vocal cords. The vocal cords sit right at the top of the windpipe, therefore, when air rushes out of the lungs it moves through the vocal cords. When speaking, the vocal cords move close together. The air rushing through the vocal cords causes the vocal cords to vibrate generating sounds. Depending on age and sex, the vocal cords will vibrate from 100 to 250 times per second. Articulators (tongue, lips, teeth) move in specific patterns to shape the sound generated from the vocal cords into speech sounds. The brain is responsible for sending a message by way of a nerve to the vocal cords to be in the appropriate position to vibrate when the air rushes through them during exhalation. If there is damage to the brain, or changes in the way it functions then this message may not be sent, resulting in a change in vocal quality. The nerve that supplies the information to the vocal cords regarding their position may be damaged as well.

### **Voice Quality**

As a result of PD voice quality may sound hoarse, breathy or low in loudness. This is caused by the vocal cords in the larynx/throat not firmly meeting in a regular rhythm or closing pattern when the voice is produced. Below are two checklists (Hogikyan & Sethuraman, 1999; Hogikyan & Rosen, 2002, Jacobsen, Johnson, Grywalski, Silbergleit, Jacobsen & Benninger, 1997) that can be used to determine if changes in the voice are presenting a handicapping condition.

**Voice Handicap Index:** This index was developed for patients that experience difficulty with their voice. Sometimes the problems can become severe enough that it imposes a handicapping condition. The Voice Handicap Index can be used as a way to see if voice problems associated with PD are adversely affecting daily activities.

**Instructions:** These are statements that many people have used to describe their voices and the effects of their voices on their lives. Circle the response that indicates how frequently you have the same experience.

0 = Never 1 = Almost Never 2 = Sometimes 3 = Almost Always 4 = Always

### Part I-Functional

1. My voice makes it difficult for people to hear me.  
0      1      2      3      4
2. People have difficulty understanding me in a noisy room.  
0      1      2      3      4
3. My family has difficulty hearing me when I call them throughout the house.  
0      1      2      3      4
4. I use the phone less often than I would like to.  
0      1      2      3      4
5. I tend to avoid groups of people because of my voice.  
0      1      2      3      4
6. I speak with friends, neighbors, or relatives less often because of my voice.  
0      1      2      3      4
7. People ask me to repeat myself when speaking face-to-face.  
0      1      2      3      4
8. My voice difficulties restrict personal and social life.  
0      1      2      3      4
9. I feel left out of conversations because of my voice.  
0      1      2      3      4
10. My voice problem causes me to lose income.  
0      1      2      3      4

### Part II-Physical

1. I run out of air when I talk.  
0      1      2      3      4

2. The sound of my voice varies throughout the day.  
0      1      2      3      4
3. People ask, "What is wrong with your voice?"  
0      1      2      3      4
4. My voice sounds creaky and dry.  
0      1      2      3      4
5. I feel as though I have to strain to produce voice.  
0      1      2      3      4
6. The clarity of my voice is unpredictable.  
0      1      2      3      4
7. I try to change my voice to sound different.  
0      1      2      3      4
8. I use a great deal of effort to speak.  
0      1      2      3      4
9. My voice sounds worse in the evening.  
0      1      2      3      4
10. My voice "gives out" on me in the middle of speaking.  
0      1      2      3      4

### **Part III-Emotional**

1. I am tense when talking to others because of my voice.  
0      1      2      3      4
2. People seem irritated with my voice  
0      1      2      3      4
3. I find that other people don't understand my voice problem.  
0      1      2      3      4
4. My voice problem upsets me.  
0      1      2      3      4
5. I am less outgoing because of my voice problem.  
0      1      2      3      4
6. My voice makes me feel handicapped.  
0      1      2      3      4

7. I feel annoyed when people ask me to repeat.  
0      1      2      3      4
8. I feel embarrassed when people ask me to repeat  
0      1      2      3      4
9. My voice makes me feel incompetent.  
0      1      2      3      4
10. I am ashamed of my voice problem.  
0      1      2      3      4

Often it is the caregiver who realizes the change in communication before the person with PD. A care partner, family member or friend who has regular contact can help complete the form below. The respondent should carefully read each statement, thoughtfully consider if it applies, and make a check mark if it does:

### Caregiver Questionnaire

1. I have difficulty hearing my Parkinson partner when he/she speaks.
2. I have difficulty understanding his/her speech.
3. My Parkinson partner does not talk as much as in the past.
4. My Parkinson partner does not attend social functions as frequently as in the past.
5. He/she often asks me to make phone calls or order from a menu for him/her.
6. My Parkinson partner clears his/her throat often.
7. My Parkinson partner often sounds as if he/she is running out of breath when speaking.
8. My Parkinson partner suspects that I need a hearing aid.
9. My Parkinson partner thinks I ignore what he/she has to say.

Multiple “yes” answers, or a “yes” answer to even one issue could interfere with daily communication. This may be sufficient to request referral for a complete speech and voice evaluation because the difficulties that are being experienced may have an underlying medical cause.

Try these suggestions to improve voice quality:

- Try to produce a staccato or sharp sound while producing voice.
- Keep the loudness level of the voice up by pushing air from the abdomen.
- Practice speech drills and lip and tongue strengthening exercises (see Appendices)
- Protect the vocal cords by avoiding excessive coughing, throat clearing or yelling.
- Protect the vocal cords by keeping the home air moist. Use a humidifier, if necessary

## VOCAL LOUDNESS

There are many aspects of speech or voice that can be affected because of PD. Low vocal loudness level means that the vocal output is softer than normal. Often time persons with PD indicate that they cannot be heard or that they have a hard time speaking over crowd noise like that, which occurs at a social gathering. Also, family members or a spouse may complain that the person with PD is not speaking up loud enough and it can lead to frustration during communication interaction. The difficulties that persons with PD have with vocal loudness have been well studied. Some believe that it results because of the changes that occur to the muscles that help the voice get loud, like the muscles of the vocal cords or the muscles that control breathing. Others believe that the person with PD needs to be trained how to speak louder and that with adequate training using a louder voice can be achieved. The training programs that are used to help persons with PD will be discussed later in this section.

**There are some strategies that can be used to increase the loudness level of the voice such as:**

- ❑ Take a big breath before beginning to speak. This helps give enough air to speak on and will actually make the voice come out louder. Start by trying to hear the voice as soon as the breath is allowed to exhale. Begin by breathing in and then slowly exhaling. Try to control the air that is released when you exhale (slow and controlled). Next, say the vowels “ah” or “ee” with the lips slightly parted on a steady flow of exhaled air. Try to hold the sound for at least 15-20 seconds or make that an eventual goal as the practice continues. This can be done three times in a row with a 1-2 minute rest after each of the three sound productions. This should be done 3-4 times a day to help gain control of the breathing and develop an awareness of how speech is produced.
- ❑ Make sure that the sentences/phrases that are spoken are not too long. The longer the phrase the more air that is used. If the amount of air runs out then it will require more physical effort to keep the voice loud. A phrase like: “The other day I went to the store” would be a phrase of adequate length. After finishing the phrase, another breath needs to be taken, if not it will be very difficult to make the voice stay loud.
- ❑ It can help if muscles in the abdomen are used to help force air out the lungs. This is especially true when the voice is used to yell or talk very loud over crowd noise. Try speaking aloud a short staccato counting phrase “hut, 2,3,4.” Keep a hand on the abdomen and feel the in- and out- movement of the abdominal wall.
- ❑ Maintain a good posture. It is most efficient if the body and head are facing straight. If the head is tilted to one side or the posture is slouched it does not allow the muscles that are working together to produce speech to be in an optimal position.
- ❑ Open the mouth when speaking. If the mouth (jaw and lips) are not moving very much during speaking it actually makes the sound come out

less loud. Try at first to over exaggerate lip and mouth movements when saying vowels such as “ah” or the words found in Appendix C. Hear and feel the difference when the mouth is open wide compared to trying to speak through nearly closed lips.

If it is still difficult to make the voice loud after trying some or all of these exercises, then there could be some other reasons that are preventing progress. First, discuss these difficulties that are being experienced with a neurologist and/or speech pathologist. They may make a referral to other specialists to determine if:

The vocal cords are weak and unable to close properly. A consult with an Ear, Nose and Throat doctor (otolaryngologist) may be made to examine the function of the vocal cords.

The lungs are not functioning normally. A consult with a pulmonologist may be made to test the function of the lungs.

See Appendix B for some functional phrases and sentences to use at home to practice projecting vocal loudness.

## **Voice Amplifiers**

There are some circumstances where the voice needs additional help in being made loud. These circumstances include work environments that are noisy and require the voice to be loud for long periods of time. With PD the voice will tire over time and even the strategies listed above may not be enough to keep the voice loud. In these situations augmentative devices can be used to give the voice that extra power it needs. These devices are called amplification units or voice amplifiers. The amplifiers can be personal amplifiers worn on the body or placed in a room, such as classroom or conference room. Sometimes the microphone is worn on the lapel of a shirt or is part of a headset system. Remember the amplifiers will not improve the quality of the voice, it will simply make it louder. Most of the devices on the market can at least double the loudness level of the voice. A speech pathologist and family members can help decide which type is the best device for the situation. Additionally, the amplifier should be comfortable to the person with PD. The following list is a sample of companies that market voice amplification systems, which might be useful in providing compact personal amplification systems for people with low-volume speech.

❑ Luminaud, Inc.  
8688 Tyler Blvd.  
Mentor, Ohio 44060  
800-255-3408  
440-255-9082  
FAX 440-255-2250  
Email: info@luminad.com

❑ Communicative Medical, Inc.  
PO Box 8241  
Spokane, WA 99203- 0241  
800-944-6801  
Fax: 360-546-3841

- ❑ One to One Communications  
15738W 148<sup>th</sup> Terrace  
Olathe, Kansas 66062  
913-764-4072
- ❑ Park Surgical Company  
5001 New Utrecht Avenue  
Brooklyn, NY 11219  
718-436-9200
- ❑ Phone Merchants  
929 West Pike Street  
Clarksburg, WV 26301  
877-291-1076
- ❑ Anchor Audio, Inc.  
5931 Darwin Court  
Carlsbad, CA 92008  
1-800-262-4671
- ❑ Crestwood Communication  
Aids, Inc.  
PO Box 091007  
Milwaukee, WI 53209  
414-351-0311
- ❑ Lauder Enterprises, Inc.  
4754 Shavano Oak  
Suite 104  
PO Box 78249  
San Antonio, TX 78249-0427  
210-492-0864
- ❑ Phonic Ear, Inc.  
20809 Lakeville Highway  
Petaluma, CA 94954  
707-769-1110
- ❑ Professional Speech Aid Service  
30 Salem Marketplace  
Salem, CT 06420  
1-800-454-7778
- ❑ ZYGO Industries, Inc.  
PO Box 1008  
Portland OR 97207-1008  
1-800-234-6006

Insurance coverage for amplifiers: MEDICARE does not usually cover amplifiers, but they are considered on an individual basis and some people have been reimbursed, so it may be worthwhile to submit a claim.

Here are some other suggestions that can be used to enhance communication.

1. Choose the best spot to communicate. Areas with appropriate lighting and very little noise are the best;
2. Look for visual cues to determine what the communication partner is trying to get across;
3. Ask for written words if needed to get on the same topic;
4. Provide feedback to the communication partner that the message has been understood or that a part of the message has not been understood;
5. Do not pretend that you understand;
6. Try not to interrupt the person who is talking with you;
7. Avoid putting objects in front of the face while speaking;
8. Avoid having objects in the mouth (i.e. gum, cigarettes, and food) while speaking;
9. Use gestures;
10. Provide clues to the communication partner when a subject changes;
11. Rephrase what is being said if the message is not being understood.

There are other types of devices that are used when a person's ability to communicate becomes very limited. These are also called augmentative or assistive devices. The devices can be used in addition to continued efforts at speech improvement or by themselves. Some systems are quite simple and inexpensive, while others are complex and more expensive.

**Writing** - This is most common way to communicate without speech. Keep writing materials accessible at all times. These could include paper and pencil, clipboard, small chalkboard with chalk and eraser or a magic slate (found in toy departments). When writing or printing, concentrate on keeping the letters large and well spaced.

**Pointing Systems** - This includes such items as a large board, notebook, binder or photo album with pictures of family, friends and commonly used items. Alphabet boards or notebooks with words for frequently needed items organized into categories are other helpful pointing systems.

**Electronic/Computer Systems** - These are the most sophisticated systems and may consist of a keyboard, display screen and printer. Many are portable. Size of keyboard and display/printer varies

Before purchasing a device, consult with a speech-language pathologist. The following companies are some of those marketing communication devices.

Crestwood LLC  
P.O. Box 090107  
Milwaukee, WI 53204  
<http://www.communicationaids.com>

Pointer Systems, Inc.  
One Mill Street  
Burlington, VT 05401  
1-800-537-1562  
<http://www.pointersystems.net>

TradeMark Medical  
449 Sovereign Court  
Baldwin, MO 63026  
646-527-2288  
<http://www.trademarkmedical.com>

Words+  
42505 10<sup>th</sup> St. West  
Lancaster, CA 93534  
800-869-8521  
<http://www.words-plus.com>

Mayer-Johnson Company  
2100 Wharton Street STE 400  
Pittsburgh, PA 15203  
412-381-4883  
<http://www.mayer-johnson.com>

Communication Skill Builders  
555 Academic Court  
San Antonio, TX 78204  
1-800-869-8521  
<http://www.psychcorp.com>

Attainment Company  
P.O. Box 930160  
Verona, WI 53593-0160  
<http://www.attainment-inc.com>

Dynavox Systems Mayer-Johnson  
2100 Wharton Street, Suite 400  
Pittsburgh, PA 15203  
<http://www.dynavoxsys.com>



ZYGO Industries, Inc.  
P.O. Box 1008  
Portland, OR 97207-1008  
800-234-6006  
<http://www.zygo-usa.com>

CCT  
508 Bellevue Terrace  
Pittsburgh, PA 15202  
412-761-6062  
<http://www.concommtech@compuserve.com>

ACCI  
280-B Moon Clinton Road  
Dept 96-I  
Moon Township, PA 15108  
800-982-2248  
<http://www.accinc.com>

Prentke RMCH Company  
1022 Heyl Road  
Wooster, OH 44691  
330-262-1984  
[www.prentrom.com](http://www.prentrom.com)

## Programs To Help Improve Voice Loudness

One of the most widely used programs that has been tested and shown to have positive outcomes for persons with PD is called the “The Lee Silverman Voice Treatment” (LSVT) program. Lorraine O. Ramig, Ph.D., CCC-SLP, and Carolyn Mead, M.A., CCC-SLP developed this program, in 1987. Both are speech pathologists. It was named after one of the first patients to receive this treatment. It is an intensive behavioral treatment program that requires a person with PD to engage in 16 therapy sessions in one month. The major goal of the technique is to help improve vocal loudness, but as a result of the therapy, improvements in speech clarity and breathing often result. While the number of sessions to be completed in one month is very intensive the outcomes of the program is long lasting (Ramig, Sapir, Countryman, Pawlas, Obrien, Hoehn, Thompson, 2001). More information on the program can be found at [www.lsvtglobal.com](http://www.lsvtglobal.com)

The LSVT program consists of five essential concepts:

**Concept 1:** focuses on the VOICE. This concept works on helping the vocal cords close better, reinforces the idea of “THINKING LOUD/THINKING SHOUT” and attempts to train the speech to be as clear as possible.

**Concept 2:** focuses on HIGH EFFORT with emphasis on vocal and physical effort. This focus on effort is thought to override the muscles lack of movement a n d slowness of movement to new effort levels particularly as the disease progresses. The clinician helps the person with PD scale the effort needed to perform the tasks during therapy.

**Concept 3:** sixteen sessions are done on an individual basis for a period of one month. This provides daily opportunity to practice and over the 16 sessions, allows the degree of vocal effort to be increased. It helps maintain a certain level of motivation and accountability. It also provides adequate time for the skill(s) to be learned and transferred to other environments such as home or work. Finally it allows the SLP to document any fluctuations in the patient’s perform-

ance.

**Concept 4:** focuses on defining what the patient “knows” and “accepts” about the amount of effort needed to consistently increase vocal loudness to a level that is within normal limits. The relationship between increased vocal effort and vocal output is then established. Those with PD often have problems knowing how loud their voice is.

**Concept 5:** focuses on quantification. The key is to motivate the patient and provide feedback about the improvement or the need for more improvement. During this phase all five concepts are integrated and all focus on high effort voice used daily.

Some persons with PD indicate that LSVT has been an excellent program for improving voice. There is some research as well to suggest that LSVT may improve swallowing function, however, the most direct outcome with LSVT are improvements in speech and voice.

## VOCAL PITCH

### Pitch Variation

The speech of people with PD often has very little melody or pitch variation. This is called monotone speech. It can be hard to listen to because it is the inflection of speech that keeps listeners involved in a conversation. Speech, which is monotone, or produced almost constantly on the same note, lacks liveliness. It can be boring to listen to and sometimes it is misunderstood. The pitch of the voice is what controls the variation of the highs and lows of the voice. Pitch is controlled by how fast the vocal cords vibrate, so it is understandable that someone with PD that has muscle impairment may have difficulty varying the pitch of the voice.

When practicing the words, phrases and sentences found in the Appendices try to put pitch changes into the speech. Think about the melody of the speech while talking. Remember these principles for voice inflection:

- ❑ When making a statement, start the sentence at a slightly higher pitch so that the pitch can be brought down at the end. For example:
  - It's time to go home.
  - I am happy to meet you. ↘
  - The dog had seven puppies. ↘
- ❑ When asking a question that could be answered “yes” or “no”, do the opposite. Start lower and raise the pitch at the end. For example:
  - Are you ready to go? ↗
  - Should we go to the movie today? ↗
  - Would you like more coffee? ↗
- ❑ When asking a question that needs more than a “yes” or “no” answer, lower the pitch at the end of the question. For example:
  - Should we have soup or sandwich? ↘
  - What would you like for breakfast? ↘
  - Do they live in Minneapolis or New York? ↘
- ❑ Emphasize important words by bringing the pitch level up when they are said.
- ❑ When reading the speech practice material, draw arrows to aid in indicating when to change the pitch. Draw ↗ to bring the pitch up; draw ↘ to bring the pitch down.
- ❑ Practice pitch changes when singing. Try to exaggerate the pitch range when singing.

### Biofeedback for Improving Voice Production

Biofeedback is a technique that gives the person with PD information about how speech sounds or how it is being produced to make it sound the way it does. Biofeedback can also be a therapy tool drawing on relaxation techniques or other techniques to help an individual gain voluntary control so that a desired response can be achieved. An example would be trying to achieve a certain vocal loudness

or vocal pitch. Biofeedback techniques will help the individual target the loudness level that is appropriate for the speaking task. Visual and auditory biofeedback is a major component of patient education, self-monitoring skills and documentation of treatment effectiveness. Technology is rapidly developing and there are many adept devices at surprisingly low cost. Software for biofeedback of speech production is available at:

[www.kayelemetrics.com](http://www.kayelemetrics.com)

1-800-289-5297

## ENHANCING SPEECH

### Slow and Even Speech Rate

Sometimes people with PD experience “rushes” of speech – very rapid speech with an uneven tempo. It is very difficult to keep precise speech sound production when the speech is moving very fast. Speech becomes difficult to understand.

### Precise and Clear Speech Sounds

All talkers differ in the way they speak. Some people talk fast, some people use more gestures with their hands to get their point across, while some use pauses to make a point. The speech of people who have PD is often difficult to understand because the individual speech sounds are not made clearly or precisely. The result is speech that sounds, “slurred.” Any of the following reasons can contribute to this difficulty. Recall that the disease affects the movements of the oral structures that produce speech and some of the symptoms that may make it difficult to speak clear are:

- Slow and imprecise lip movements.
- Slow and imprecise tongue movements.
- Poor ability to move the tongue and lips together in a way that is coordinated and rapid enough to be able to produce all of the speech sounds clearly.

There is a technique called Clear Speech (Picheny, Durlach & Braida, 1985; Schum, 1996) that is used by persons who talk to those who are hearing-impaired, and it can be used by anyone wishing to better their pronunciation so that their listeners may understand them. The program focuses on key skills needed to improve the clarity of speech and also helps build confidence in the speaker. Not being able to be understood is frustrating for the speaker and can, at times, make the speaker withdrawal from communication interactions because of the difficulty of being understood. The following exercises can be tried to improve the clarity of speech.

### Clear Speech Exercises

- Practice lip strength and flexibility exercises (see Appendix C).
- Practice tongue strength and flexibility exercises (see Appendix D).
- Before starting to speak, swallow all excess saliva in the mouth.
- Say all sounds clearly and firmly – exaggerate the sounds and do not leave any sounds of any words out.
- Start by practicing single words, then two and three word phrases, short sentences and paragraphs. (see Appendix B).
- Make sure the lips meet firmly for b, p, and m sounds.
- Try to “explode” the sounds t, d, k, and g.
- Pause between words and remember to keep the vocal loudness up until the end of the sentence.

- ❑ When talking, remember to use shorter sentences.
- ❑ Simplify the message for the listener.
- ❑ Speak at a slightly slower than normal rate, so the words can be said better.
- ❑ Do not strain to say every word perfectly.

Clear Speech is naturally louder, lively and full of distinct and meaningful pauses. It has been found that simply training with these exercises for 5 -10 minutes a day has a positive carryover to conversation activities and can last up to a few months with some re-training needed if the person starts to lose the Clear Speech strategies once learned.

Other strategies that have been offered to help produce clear speech is to practice the following:

- Say short sentences while tapping out an even rhythm with a finger on the table, chair or leg.
- Say one syllable, or one word part, for each tap.
- Say short sentences in time with a slowly ticking metronome. Say one word or syllable per beat.
- Put a row of colored dots on a piece of paper. Say one word or syllable as you touch each dot in a slow and even rhythm.

There is a system called the Facilitator which provides Delayed Auditory Feedback that can also be used to help slow down speaking rate. For the individual whose speech improves with delayed auditory feedback (DAF), the DAF on the Facilitator makes the instrument a powerful assistive speaking device. Details on a DAF system can be found on [www.kayelemetrics.com](http://www.kayelemetrics.com).

## SWALLOWING FUNCTION

The term that is used for swallowing dysfunction is dysphagia. In order to determine if a swallowing dysfunction is occurring there are certain symptoms to pay attention to. It is not uncommon for people with PD to report difficulty with chewing and swallowing. That is because the physical changes in the muscles used for speech also can affect the ability to chew and swallow safely. The primary problems reported are:

- Slow rate of eating.
- Fatigue during eating.
- Food “sticking” in the throat.
- Coughing or choking on food or liquid.
- Difficulty in swallowing pills.

**Other swallowing symptoms that can be encountered include:**

- Difficulty initiating swallowing.
- Unexplained weight loss.
- Change in dietary habits.
- Recurrent pneumonia.
- Change in voice or speech.
- Nasal regurgitation.
- Sensation of food sticking in the chest.
- Oral or pharyngeal regurgitation.

When someone is having difficulty with swallowing you may notice symptoms when they are drinking and eating. There are some very common questions that can either be asked or answered to determine if the patient with PD is having these difficulties. Below are some questions that can be used to obtain an initial impression of whether swallowing difficulty exists.

If you answer “true” to one or more of these then consult with a primary care physician/neurologist about these problems immediately. A swallowing evaluation may also be recommended.

1. I feel weak and tired often.
2. Most days, I don't care if I eat or not.
3. I have recently experienced an unintentional loss of weight.
4. It takes me longer to eat than other people.
5. It takes me forever to eat a meal.
6. I still have food remaining in my mouth after several attempts to swallow.
7. I pocket food on either side of my mouth.
8. I don't enjoy eating anymore.
9. I cough before, during, and after I swallow.
10. I choke often when I eat food.

11. I choke or gag when I drink liquids.
12. I have thick or excess saliva or phlegm.
13. I drool sometimes.
14. I have problems chewing.
15. I have to clear my throat often.
16. Sometimes I have problems breathing.
17. I get pneumonia more than once a year.
18. Food sticks in my throat.
19. Food sticks in my mouth.
20. Food or liquid dribbles out of my mouth.
21. Food or liquid comes out of my nose.
22. I cough food or liquid out of my mouth when it gets stuck.
23. Figuring out what I can or cannot eat is a problem for me.
24. It's difficult to find food that I both like and can eat.
25. People have a hard time understanding me.
26. My voice sounds gurgly.
27. It's been difficult for me to speak clearly.
28. I fear I may start choking when I eat food.
29. I am afraid of choking when I drink liquids.
30. I never know when I'm going to choke.

The following is a checklist for the caregiver to help identify if there are issues with swallowing in the person with PD.

1. My partner with PD seems uninterested in food.
2. He/she coughs during meals.
3. He/she takes longer to eat a meal than previously.

### **What is a swallowing evaluation?**

A swallowing evaluation includes a radiologist and SLP's examination. This exam could include an "x-ray in motion", or videofluoroscopy, to detect the specific location of problems in the swallowing mechanism. Fiberoptic endoscopic evaluation of swallowing (FEES) is another type of test that could be performed during a swallowing exam. It is a procedure that allows for the direct viewing of swallowing function when regular food materials are eaten. The FEES is a separate procedure, but may be used in conjunction with videofluoroscopy.

During the videofluoroscopy, the patient will be asked to eat and drink various consistencies (pudding, water, milk, cookies, etc.). The x-rays will be taken during the chewing and swallowing process.

For the FEES examination, a very thin flexible fiberoptic tube will be passed through the nasal passage that is hooked up to a camera and light source. The tube does not go down the throat, but provides a bright light so the swallowing can be



observed. This procedure is painless and well tolerated by most individuals. Following a complete swallowing evaluation, an intervention program is established for the patient and family support members. Recommendations may include:

- Best feeding techniques.
- Exercises to strengthen oral and throat muscles.
- Compensatory techniques to assist in safe swallowing.
- Oral and mouth care techniques.
- Recommendations for modification of food texture.
- Safe positioning strategies.
- Patient/family education.
- Assessment of the adequacy of swallowing.

## **Swallowing Food and Liquids**

Below are techniques to make eating easier and safer:

- Sit upright during all eating and drinking, even when taking pills.
- Tilt the head slightly forward, not backward, as you swallow.
- Take small bites of food, chew thoroughly, and do not add any more food until everything from the first bite has been swallowed.
- Take small sips of liquid. Hold the liquid in the mouth for a short time to prepare for the swallow.
- Concentrate on moving the food backward in the mouth with the tongue.
- “Double swallow” (swallow a second time) if the food did not go down completely with the first swallow. Sometimes taking a sip of liquid between bites of food can help to wash the food down.
- If eating is very tiring, try several smaller meals spaced out during the day instead of three large meals. Nutritional supplements periodically during the day may be helpful in keeping calorie count high enough for good energy level.

Consider selecting the following types of foods to help ease the swallowing process. Choosing the right kinds of foods will also help in making eating easier, safer and more pleasurable. Choose foods that don't require vigorous chewing. Texture should be slippery rather than dry and crumbly.

- Moderate textured wheat breads instead of very coarse, nutty breads or very soft, white breads.
- Oatmeal, cream of wheat or moistened dry cereals instead of very coarse, dry cereals.
- Well-cooked, tender chicken/turkey, well-cooked fish without bones, chopped and ground meats, instead of stringy, tough meats that require a lot of chewing.

- Soft casseroles and poached or scrambled eggs instead of fried eggs.
- Mashed potatoes or rice, moistened with gravy or margarine, instead of wild rice or French fried potatoes.
- Soft, cooked pasta elbows, instead of long, dry spaghetti.
- Soft, well cooked vegetables, cut up or creamed, instead of raw vegetables or those with a hard texture.
- Pureed or mashed fruits, fruit juices and fruit sauces, instead of fruits with seeds or hard outer skins.
- Custard, yogurt, ice cream or other soft desserts, without pineapple, nuts, seeds or coconut.

### **Nutritional Risk Factors**

When a person is sick or suffering from a debilitating disease process it changes his/her ability to accomplish tasks, which appear easy to a healthy person. Persons with PD are often sedentary, their activity levels drop and the need and energy for eating can diminish. The drop in energy can lead to a lack of desire to prepare foods, thus reducing the amount of food eaten and the nutritional consistency. This, along with difficulty chewing foods and swallowing them, can lead to substantial reductions in weight. Coupled possibly with dietary restriction due to medication use and/or other drug side effects such as nausea, vomiting and constipation can place the person with PD at high-risk for malnutrition.

### **Nutritional Suggestions ([http://www.wemove.org/par\\_nphm.html](http://www.wemove.org/par_nphm.html))**

- Eat a balanced diet, including all food groups
- Consume sufficient calories to maintain weight
- Consume adequate fiber and fluids to avoid constipation
- Take vitamin D and calcium to prevent osteoporosis
- Reduce protein to minimum daily allowance – Take it with the evening meal

### **Drooling**

Poor control of saliva is known as sialorrhea. The reason that persons with PD have problems controlling saliva is because, in some cases, the muscles of the oral cavity, face, and neck have less control than normal. Sometimes there is excess saliva in the mouth because swallowing is less frequent. Problems encountered with drooling may be due to the fact that swallowing is less frequent or there is a delay in the person's ability to trigger the swallowing process. There are certain drugs that can be prescribed to help reduce the amount of saliva produced, but one should not take a drug that will result in completely drying the mouth (Dworkin & Nadal 1991). Close communication with a primary care physician or neurologist is recommended in order to best treat this condition.

The following techniques may help control the saliva that is not being controlled adequately:

- Keep the chin up and the lips closed when not speaking or eating.
- Do lip & tongue exercises (see Appendix C & D) to strengthen the lip muscles.

- Swallow often.
- Always swallow before starting to speak and as often as needed while speaking.
- Avoid sugary foods because they cause more saliva to develop.
- Chew food well.
- Ask a doctor about medications that may help the problem.
- Have family members learn the Heimlich maneuver.

## HEARING

Hearing problems are not directly caused by PD but certainly are associated with aging. Hearing loss can be experienced by the person with PD or affect the spouse or caregiver of the person with PD. Approximately one in every ten people in this country has a hearing loss. Projections indicate that this number and percentage will grow as baby boomers age and increasing noise pollution continues to take its toll. Hearing loss affects everyone that needs to interact with the hearing impaired individual. Poor hearing seriously interferes with communications and when compounded with the difficulties that persons with PD already have with their speaking it can significantly diminish the communication interaction. The most common type of hearing loss that occurs with age is called a sensorineural hearing loss. A sensorineural hearing loss is caused by damage to the inner ear and/or the auditory nerve. Noise, certain medications, as well as age can contribute to this permanent hearing loss. Most sensorineural hearing losses can be treated effectively with hearing aids. If you suspect a hearing loss or are the spouse or caregiver of a person with PD, seek a professional consultation with an audiologist. An audiologist is a professional who specializes in hearing evaluation and treatment.

The techniques below will be helpful when communicating with someone who has difficulty hearing:

- Always let the listener see the face of the speaker. A distance of three to six feet between speaker and listener is best.
- Do not speak to a person who has difficulty hearing from another room. Get his or her attention before you start to speak.
- Don't try to communicate in a noisy environment. Turn off the radio or the TV or go to a quiet place for conversation.
- Don't shout. Raise the volume a little and speak clearly.
- Never talk directly into a hearing impaired person's ear.
- Keep the rate of speech slow.
- Repeat the message, if needed. If the person with hearing impairment does not appear to understand what is being said, rephrase the statement rather than simply repeating the misunderstood words.
- Above all, treat the person with hearing impairment as an adult, and particularly those that are elderly, with respect.

## **Types of Hearing Aids**

There are four basic styles of hearing aids.

Behind-The-Ear (BTE) hearing aids are extremely flexible and work for all types of hearing loss. The hearing device is housed within a curved shell that sits behind each ear and delivers sound through a clear tube. The clear tube fits into a mold that has been customized to comfortably fit inside each ear.

In-The-Ear (ITE) hearing aids are very easy to operate, even if the user has poor control of the hands. These are the most widely recommended hearing aid style. The hearing device is housed within a custom-made shell that fits comfortably inside each ear and delivers sound directly to the ear.

In-The-Canal (ITC) hearing instruments can barely be seen and are very easy to operate, even if the user has poor dexterity. The hearing device is housed within a custom-made shell that fits comfortably inside each ear canal and delivers sound directly to the ear.

Completely-In-The-Canal (CIC) hearing aids are the newest and smallest type, virtually invisible. The hearing device is housed in a tiny shell that fits comfortably and completely into each ear canal. The device is removed from the ear canal by pulling a tiny cord.

Open-Fit Hearing Devices are new technology hearing aids that are similar to BTE, however, they are used with patients with close to normal low frequencies and a sloping high frequency hearing loss. The device has a wire that travels down into the ear canal making it less noticeable and leaving the natural sound to be routed through the ear canal.

## BODY LANGUAGE

Not all communication takes place with speech and words. People also communicate with each other by their body language and gestures. Facial masking, or lack of facial expression that is common in those with PD, is a result of rigidity and reduced range of movement in the muscles of the face. Some friends and family members report that the listener who displays no facial expression does not seem interested in their conversation. Facial expressions, as well as other nonverbal gestures, contribute to and enhance the communication process. We can use facial expressions, head movements, hand and arm gestures, and body posture and body position to clarify or add to what we are saying.

Using body language in communication can be a special challenge to people who have PD because of facial masking, slowness of body movements and rigidity of muscles. Practice body language and gestures and then make a point of using them when you are talking.

Practice and remember the following:

- ❑ Eye contact is probably the most important type of non-spoken communication. Always make eye contact when you are talking. Making eye contact shows that you are interested in communicating and in the listener.
- ❑ Practice exaggerating facial expressions. What does the face feel and look like when expressing emotions such as happiness, sadness, worry or concern? Practice these facial expressions: raise the eyebrows, wrinkle the forehead, open the eyes widely, squint the eyes, smile broadly, purse the lips. Use these movements of facial muscles when talking.
- ❑ Keep the lips closed when listening. Having lips closed indicates concentration and attention.
- ❑ Use body posture to show feelings when talking. Leaning slightly forward in the chair shows interest; leaning back in the chair may show that a state of relaxation and comfort. Leaning back and breaking eye contact can show that a lack of interest in communicating or that the communication should stop.
- ❑ Use gestures to add to the spoken message. Shrug the shoulders, clasp the hands, turn the head, raise the arms.
- ❑ Simply pointing to what is being talked about can be effective ways to add to the spoken message.

## **MEDICATION EFFECTS ON SPEECH AND VOICE**

While medications are the primary tool for management of PD, the effects of those pharmacological agents on speech, voice and swallowing deficits have been difficult to measure. Additionally, there are some side effects of PD medications that may negatively impact voice, speech and swallowing functions. It is of extreme importance that persons with PD realize the cycle of their medication in terms of peak and off peak effects that accompany the cycles of medicine regimen.

### **Helpful Strategies:**

- Be aware of the ‘on’ cycle of PD medications as the voice, speech and swallowing will be at its peak performance.
- Avoid too much vocal communication when tired or fatigued, or during the ‘off’ cycle of the PD medications.
- Schedule important phone calls and other conversational interaction during the “on-cycle” of the medication regimen.
- Take time to rest between multiple phone calls and important communication interactions.

## APPENDICES

### A. Voice Strategies: A Home Practice Routine

Integrating family members or friends is an important part of the therapy process. Having this type of support makes it easier to carryover the therapeutic strategies from a treatment session to daily activities. Also, family and friends can lend a hand by reminding you when the voice is not loud enough or clear enough. Sometimes a simple hand gesture can be a reminder to increase the loudness. These helpful reminders can help motivate a change in communication effectiveness. Below are some “homework routines” that can be completed. It’s helpful to be consistent, therefore try to choose a time of day to practice these exercises for 10 minutes without interruptions. You may wish to practice once in the morning and once in the afternoon. If you are unable to practice with a partner who can provide feedback then try to practice with a recording device so that you can play back and listen to the voice and speech production.

1. Take a big deep breath and say the vowel “ah” in a loud voice. Try to hold the vowel as long as possible;
2. Repeat #1, except this time glide from the lowest possible tone (pitch) to the highest tone (pitch). Keep the voice loud and steady;
3. Practice reading short phrases, sentences and reading paragraphs in a loud, high energy voice.
4. Try talking in conversation in a high-energy voice;
5. Try making phone calls to friends or family members and be sure to use a high energy voice, be aware of the number of times repetition is requested;
6. While driving or riding in a car, practice saying aloud the street signs or places passed
7. Read short books or newspaper articles out loud. Read books to children or grandchildren in a loud voice.



## B. Exercises for speech practice

Single words

Phrases

Sentences

Paragraphs

Start with the shortest speech material first, and then move to the longer and more complicated exercises. Work independently or with someone else, if possible.

Read the words, phrases or sentences aloud or repeat them after someone else. It doesn't help if the material is read silently.

- Use a tape recorder so progress can be listened to.
- Try to use all of the principles from this booklet when practicing.
- Make up independent speech practice material for more variety.
- Remember...the best practice is using speech!

**Words and Functional Phrases. \*When reading aloud, hold paper upright in order to project the voice.**

Hello	Good-bye	Good morning
Goodnight	How are you?	See ya later
Who is this?	This is _____	What's up?
Help me!	Thank you	No thank you
That's okay	Very well, thanks	You're welcome
Sure	I hope so	No
Take care!	I'm ready	Not today
Can you get that	You're kidding?	Never mind
Why do you ask?	Do you see it?	I'm not sure
Could you get that?	Do you know him/her	Happy Birthday
Not too good	It's over there	Where's the paper
Please go to the store	Better than before	It's time to go
Who's on the phone	I have to go to the bathroom	I am not feeling well

## Functional Sentences

- Let's go out tonight.
- How was your day?
- Let's have chicken for dinner tonight.
- It was nice to meet you.
- Could you help me with this?
- Did you get that?
- I don't need any help.
- Where are you going?
- Who was that?
- Have you met \_\_\_\_\_?
- Have a good day!
- What time is it?
- Please pass the \_\_\_\_\_.
- Would you do that for me?
- Did \_\_\_\_\_ call today?
- This is my friend, \_\_\_\_\_.
- It's so good to see you!
- Did you lock the door?
- That was so nice of you!
- Could you turn off the T.V.?
- Are all of the windows closed?
- Is the air conditioning on?
- What do you have to drink?
- I'd like to order a pizza.
- What time will you be home?
- What's the weather like outside?
- I'm hungry. How about you?
- Turn off the lights when you come up.
- I can't find my glasses. Have you seen them?
- I was wondering what time you would be home.
- Could you direct me to the restrooms?
- Would you like a cup of coffee? I could go for one.

## Paragraphs

1. Bird watching can be fun and a rewarding hobby. All that is needed to get started is some type of bird feeder, some birdseed, a window to watch from and patience. Once the birds discover your bird feeder, they pass the word along to other birds. Before long, your patio or deck can become a regular stop for the neighborhood birds. Look for chickadees, nuthatches, blue jays, sparrows, and wrens in the summer. More unusual birds like goldfinches and bluebirds may also appear. In the winter enjoy the bright red of the cardinal or the black and white juncos.

2. Your library card can be your ticket to entertainment, current events and new ideas. Almost every city has a public library and there is no charge for a library card. Libraries have books about many subjects, but there are also other things at the library. These include books on cassette tapes or CDs, videotapes, large print books, music CDs or tapes and magazines. Many have free programs in the afternoon or evening about travel, hobbies or other topics of interest. Some cities also have a bookmobile service, which brings the library right into your neighborhood.

3. Any magazine or newspaper can be used to find additional and interesting reading material

## **C. Lip Movements**

These exercises will help increase the flexibility and strength of the lips. This will help both speech and eating. Practice in front of a mirror. Always keep the lips closed when you are not eating or speaking. This will help maintain lip strength.

- Rub the lips together firmly.
- Smack the lips. Try to make a loud smacking sound.
- Pucker the lips-as for a kiss-then relax.
- Alternate smiling and lip puckering. Saying the sounds “eee-ooo” may make this easier to do.
- Practice whistling.
- When with family and friends, SMILE.

## **D. Tongue Movements**

The tongue is a muscle. It needs exercise to improve strength and flexibility. This will help when speaking and eating. Use a mirror during practice so to see and feel what is being done. Repeat each exercise 5 to 10 times or as often as possible

- Stick the tongue out and pull it back in;
- Stick the tongue straight out and push it against resistance, such as the back of a spoon;
- Stick the tongue straight out and move it slowly from corner to corner of the mouth;
- Do the same movement inside the mouth, alternating pushing against each cheek;
- Open the mouth and raise the tongue tip up to the ridge behind the front teeth. Bring the tongue down to rest;
- Raise the tongue tip up to the roof of the mouth and pull it back along the roof;
- Bring the tongue down to rest;
- Lick all of the way around the lips, making a smooth, even circle with the tongue.

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## PARKINSON'S WEBSITES

### General Information

<http://pdring.com>

Parkinson's Disease Web Ring

<http://www.apdaparkinson.org>

American Parkinson Disease Association, Inc.

<http://www.asha.org>

American Speech-Language-Hearing Association

[http://www.ninds.nih.gov/health\\_and\\_medical/pubs/parkinson\\_disease\\_htr.htm](http://www.ninds.nih.gov/health_and_medical/pubs/parkinson_disease_htr.htm)

Parkinson's Disease — Hope Through Research. National Institute of Neurological Disorders and Stroke

### Treatment

[http://www.wemove.org/par\\_nphm.html](http://www.wemove.org/par_nphm.html)

Parkinson's disease

We move

<http://www.diseases-explained.com/Parkinsons/parktreatment.html>

Lexi-Comp, Inc.

<http://www.telegraph.co.uk/news/main.jhtml?xml=%2Fnews%2F2002%2F04%2F19%2Fnpark19.xml>

New treatment helps Parkinson's sufferer to laugh

<http://www.usatoday.com/life/health/doctor/lhdoc135.htm>

New dimensions in Parkinson's treatment

USA Today Health

<http://www.lsvt.org>

Lee Silverman Voice Therapy

### Diet and Exercise

[http://www.wemove.org/par\\_ide.html](http://www.wemove.org/par_ide.html)

Parkinson's disease WE MOVE

### Specific Conditions/Aspects

<http://www.nimh.nih.gov/publicat/depparkinson.cfm>

Depression and Parkinson's disease National Institute of Mental Health Research

**Call 800-223-2732 or visit [www.apdaparkinson.org](http://www.apdaparkinson.org)  
for the location and contact information  
for the APDA Information & Referral Center serving your area.**



American Parkinson Disease Association

**American Parkinson Disease Association, Inc.**

Parkinson Plaza  
135 Parkinson Avenue  
Staten Island, NY 10305-1946  
800-223-2732  
[www.apdaparkinson.org](http://www.apdaparkinson.org)  
[apda@apdaparkinson.org](mailto:apda@apdaparkinson.org)

**APDA National Young Onset Center**

Central DuPage Hospital  
25 North Winfield Road  
Winfield, IL 60190  
877-223-3801  
[www.youngparkinsons.org](http://www.youngparkinsons.org)  
[apda@youngparkinsons.org](mailto:apda@youngparkinsons.org)

**APDA National Resource Center for Rehabilitation**

Boston University  
College of Health & Rehabilitation Sciences - Sargent College  
635 Commonwealth Avenue  
Boston, MA 02215  
888-606-1688  
[rehab@bu.edu](mailto:rehab@bu.edu)

**APDA National Veterans Information and Referral Center**

975 Kirman Avenue  
Reno, NV 89502  
888-838-6256 Ext. 1715  
[susan.gulas@va.gov](mailto:susan.gulas@va.gov)