NeuroPong™ Handbook

ANTONIO BARBERA, MD

A table tennis program for people with Multiple Sclerosis, Parkinson's, and Dementia.

Funded by ITTF FOUNDATION

TABLE TENNIS CONNECTIONS FORT COLLINS, CO

Change the l ve of people wi h neurodegenerat ve cond ns through tab e tennis

Improving lives through table tennis

It is with great pleasure and excitement that the ITTF Foundation, together with Table Tennis Connections, presents the NeuroPong™ Handbook. The creation of the NeuroPong™ Handbook is a significant milestone in our ongoing mission to improve the lives of people with neurodegenerative conditions through table tennis.

Reflecting on our journey, it all began with the inaugural ITTF Parkinson's World Table Tennis Championships in New York in 2019. This first-ever global tournament for players with Parkinson's brought together not only the athletes but also their families and the public, fostering an environment of support, understanding and shared joy. Since then, our commitment to raising awareness of the positive health benefits of table tennis for people with Parkinson's and other neurodegenerative conditions has only deepened. In 2021, Berlin hosted the second edition of the ITTF Parkinson's World Table Tennis Championships. The event's remarkable growth, with participation doubling from the inaugural year, affirmed the profound impact that table tennis can have on the lives of those affected by these conditions. Encouraged by this success, we decided to expand our efforts, leading to the creation of the World Table Tennis for Health Festival (WTT4HF) in 2023.

The WTT4HF stands as a testament to the recognition of table tennis as a beneficial sport for neurological health. This festival features the World Parkinson's Table Tennis Championships, the World Alzheimer's Table Tennis Championships, and the World Table Tennis for Health Congress. It has become a global platform uniting individuals of various ages and backgrounds, linked by their experiences with neurodegenerative conditions. Through playing, experience sharing, and knowledge exchange, the festival promotes the myriad benefits of table tennis on the physical, mental, and social well-being of those affected by neurodegenerative conditions. It is also an event focusing on strengthening the bond within the community of those affected by neurodegenerative conditions through table tennis.

Petra Sörling, *President of the ITTF and ITTF Foundation, and* ***Leandro Olvech,*** *Director of the ITTF Foundation.*

With growing global interest in utilizing table tennis to slow down or even improve the progression and symptoms, the ITTF Foundation and Table Tennis Connections came up with the concept of the NeuroPong™ Handbook. We crafted the handbook to raise awareness of the substantial health benefits and potentials of table tennis for individuals affected by neurodegenerative conditions. It offers comprehensive scientific knowledge of these conditions and practical guidance on how table tennis can improve quality of life. Importantly, it also equips players and coaches with the tools to adopt NeuroPong™ exercises. Through this handbook, we aim to share knowledge and enable people to enjoy the health benefits of table tennis no matter where in the world they are.

Table tennis is not just a sport; it is also a powerful tool for enhancing the well-being of people with neurodegenerative conditions. We invite you to explore this handbook and join us in this transformative journey.

Table Tennis. For ALL. For a BETTER life.

Petra Sörling
ITTF & ITTF Foundation President

Leandro Olvech
ITTF Foundation Director

Handbook a collaboration between ITTF Foundation, Table Tennis Connections

Founded in 2018, the ITTF Foundation was created by the International Table Tennis Federation as an independent global nonprofit organization, operating in the space of Sport for Development (S4D). We use the characteristics of table tennis to create positive change through the sport; attracting more people to play, while working with them on different topics linked with the UN's Sustainable Development Goals, to improve their daily life.

This is achieved through five different programs:

1. Dream Building Fund
2. TT4All
3. PingPong Diplomacy
4. TT Legacy
5. TT4Health

OUR VISION:

Table Tennis. For All.
For a Better Life.

OUR MISSION:

We use the power of table tennis to deliver sustainable social change.

Table tennis is an ideal sport to attract people of all ages, irrespective of gender, culture, social background, or physical ability. It is a very healthy leisure activity with multiple benefits for physical and mental health. At the same time, it is fun.

The TT4Health Program is an initiative aimed at promoting and utilizing table tennis as a means to improve health and well-being worldwide. The program recognizes the numerous physical, mental, and social benefits that can be derived from playing table tennis and seeks to leverage the sport's accessibility and inclusivity to address various health challenges and promote an active lifestyle.

The primary objective of the TT4Health Program is to encourage people of all ages and backgrounds to engage in table tennis activities as a means of improving their overall health and well-being. The program recognizes that regular physical activity is crucial for maintaining a healthy lifestyle and preventing various non-communicable diseases, and table tennis offersa fun and

After evaluating the kind of resources currently available, we found limited information and literature around the guidelines for utilizing table tennis and training people with neuro- degenerative diseases. This handbook is a joint effort between the ITTF Foundation and Table Tennis Connections to create and deliver an impactful resource that contains a specific table tennis training program – the NeuroPong™ Program for people with Multiple Sclerosis, Parkinson's and Dementia.

NeuroPong™ embraces UN health goal

The NeuroPong™ Program promotes a holistic improvement in the quality of life for everyone, fully honoring and respecting the different physical and mental capabilities of each individual, by promoting the benefits of table tennis for everybody, especially those living with neurodegenerative conditions.

In doing so, NeuroPong™ is working toward the United Nation's Sustainable Development Goal 3 of "Good Health and Well-being" – specifically target 3.4: "By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being."

The Origin of the NeuroPong™ Program

Antonio Barbera

I couldn't move my right leg. It was completely paralyzed and I lacked any sensation. The date was March 18, 2016. I went from being an active 55-year-old Obstetrician and Gynecologist to someone who had lost his physical capabilities. I felt like the world had changed on me in the blink of an eye.

It took a minute, but I was diagnosed with Multiple Sclerosis. After the initial shock and worry subsided, I did what I always do. I began to look for a solution.

After three months of intense physical therapy, I was lucky enough to drop the cane I had started using. These months were very hard though, as I had to learn how to walk again! If you have ever experienced the functional loss of a limb (like after an accident or a mayor surgery), you can understand how intense this kind of recovery can be. Something that was such a "natural activity" was now requiring an intense physical and emotional effort, and full recovery was neither known or guaranteed. Do not get me wrong; I am grateful. Even though I had no idea how to engage my right leg for a long time, I was very fortunate in recovering my function. Since that day, I made a conscious decision to no longer use elevators. I plan to never take for granted the use of my leg again.

Less than 12 months after my first attack, I had another one. The date was March 4, 2017. And this time, I lost all sensation and motor control of my left arm. The so-called "disease modifying drug" I was on did not prevent another exacerbation and this attack happened very fast, losing function in less than 7 hours. Since recovery was not progressing as fast as my leg, I had to end my 31-year career as an Obstetrician and Gynecologist. But I was lucky again. After 9 months I was able to partially recover the function of my left arm and felt hopeful starting another medication.

Among the many Multiple Sclerosis discomforts, the worst symptom of my condition is a sensation of chest compression, known as the "MS hug."

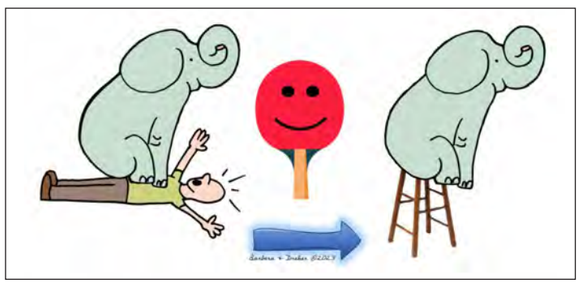
The "MS Hug"

The MS hug is a sensation that can be felt all around or in specific areas of the chest and abdomen and can last from a few seconds to an hour, even 24/7 in certain cases.

This "hug" feels like an uncomfortable, sometimes painful feeling of tightness or pressure around my chest. The peculiarity of this sensation is its constant 24/7 presence, changing location in my chest and never disappearing. Sometimes I talk about it as "the elephant sitting on my chest," changing position at its own pleasure. You will know soon why I am telling you this.

I played table tennis at the age of 16, and only for a few months. It was not until late November 2019, some 40 years later, that I started playing some table tennis in my garage with my son. While playing, I started experiencing a strange sensation that, at the beginning, I could not understand. After few days, to my surprise and pleasure, I realized that, when playing this sport, my elephant was leaving my chest and sitting in a corner; my mind was able to forget about my chest discomfort, at least temporarily.

Since this sport was relieving my discomfort, I started researching if it could be integrated in the life of other people living with MS. I found some scattered information coming from a neurologist and from some people with MS who love table tennis and had found benefits themselves. Furthermore, I learned a few groups in the world were using table tennis to help people living with Parkinson's and Dementia.



I realized that, when playing this sport, my elephant was leaving my chest and sitting in a corner.

I learned that if we challenge our brain, one specific area called the “hippocampus” is able to produce new cells (a process called neurogenesis) and these cells may create new neuronal pathways, new… connections (a phenomenon called neuroplasticity)!

Experiencing what table tennis was doing for me, I started wondering if it could provide a challenging stimulus for others to similarly help their neurogenesis. It was then that I found another inspirational path: I became the Founder and CEO of a 501(c)(3) non-profit organization called “Table Tennis Connections.”

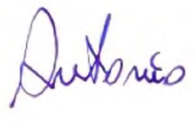
The uniqueness of our organization is promoting fun while playing table tennis. We want to provide solid science backing the benefits that this sport can offer to people with Multiple Sclerosis, Parkinson’s and Dementia. In fact, the core of our activity is the NeuroPong™ Program, a table tennis program designed for and tailored specifically for people with neurodegenerative conditions.

Our first objective is to provide a community based on diversity, equality and inclusion, where everybody can find joy in hitting a ping pong ball with their paddle. Multiple Sclerosis, Parkinson’s and Dementia are often called “invisible diseases” for how unapparent they may seem at the surface. Through table tennis, we want to create an opportunity to shine some light on the effort that many people make to continue their journey. We want to dispel the taboo often associated with these conditions, both in sports and in society as a whole. What if a 2.75-gram plastic ball and a paddle could make such a big difference?

Table tennis, being a fast game of coordination, concentration and strategy, is associated with many benefits. It’s great for hand-eye coordination; it requires focus to track the ball in movement; it requires figuring out spins and planning strategies to follow through with these tactics and executing the final shot. Be ready: the ball is coming back to you! Furthermore, one needs to remain calm and keep composure. There is no time to dwell on points blown or getting frustrated when making a mistake; the game is about gradual body and mind improvement.

We are proposing table tennis as a form of prehabilitation and neurorehabilitation to be offered at any stage of Multiple Sclerosis, Parkinson’s and Dementia; to recover from an acute attack; to prevent future episodes and to avoid a progression of the condition itself. The aim of our activity is to improve the whole quality of life of each individual involved. Besides targeting the improvement of motor function, the core of the NeuroPong™ Program is to invest in the care of the complex and often invisible panorama of non-motor symptoms associated with these conditions. First and foremost, is the improvement of cognitive function. The only two factors scientifically proven to slow down cognitive impairment are social engagement and physical activity.

Given the benefits I have experienced firsthand playing table tennis, I see tremendous opportunities in being able to help others improve their own quality of life. I hope that by sharing my journey and showing you what I have learned will help you to understand how valuable the NeuroPong™ program can be. Whether you are living with Multiple Sclerosis, Parkinson’s or Dementia or know someone who has been affected, please join our community and help spread the word.



Antonio Barbera
Founder and CEO
Table Tennis Connections

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How to use this handbook

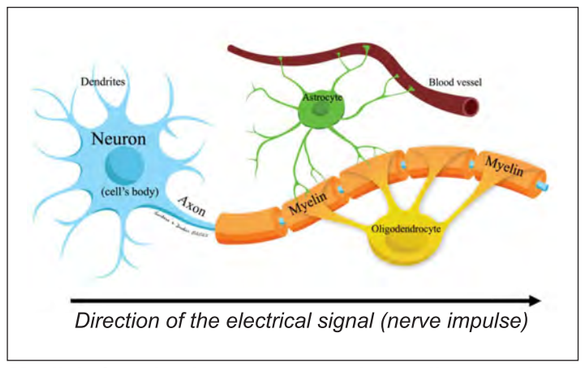
The NeuroPong™ handbook is a multi-media publication. **Click on the "Index" link at the top of every page to go to the full Index**. Navigate to each page from there. All **YouTube videos** are identified with a YouTube logo with the text **"Click to Watch."** Clicking on the logo or the photo opens the videos in a new browser window.

Brain network not immune to harm

In the realm of table tennis coaching, understanding the intricacies of brain health is paramount when working with people who have neurological conditions. The brain serves as the ultimate controller of actions, emotions, and cognitive abilities, making it essential to be knowledgeable about its structure, function, and well-being. This section of the handbook will explore the fundamentals of brain health and how it relates to coaching individuals with neurological conditions. From the basic anatomy of the brain to the principles of neuroplasticity and the management of cognitive impairments and neurodegenerative conditions, this section will delve into the science behind brain health and its implications.

NeuroPong™ participants have an intimate and deep understanding of their own conditions; coaches need to be able to communicate with them about the specifics of their conditions, be able to spot symptoms or tendencies that can be worked on and improved during that day's exercise or training session, or be able to make judgments about whether a specific activity is appropriate in the moment.

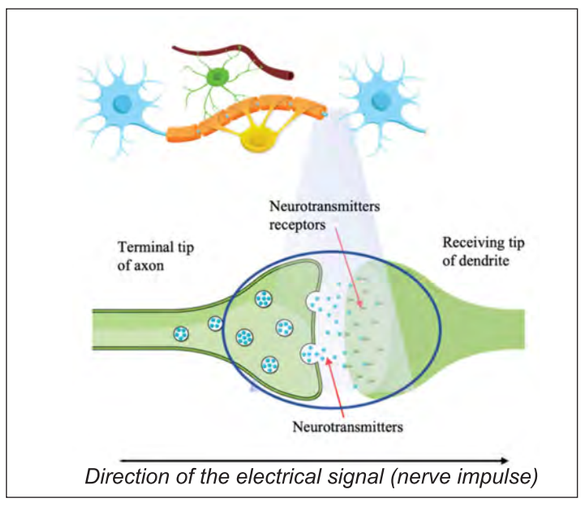
The brain's structure, function, and overall well-being are essential for all human activity. From the simplest of movements to the most complex cognitive processes, every facet of human life is intricately woven into the functioning of this remarkable organ. However, this sophisticated network is not immune to harm. Both of its components, the central nervous system (CNS, which includes the brain, optic nerve, and cervical and thoracic spinal cord) and peripheral nervous system (PNS, which includes the lumbar and sacral spinal cord) can undergo significant disturbance. Damage to vessels, infections, cancers, trauma, disorders of the immune system, and age-related changes could all lead to brain cellular death, with the consequent impairment of its very sophisticated functions.



Myelin's function is to guarantee the quality, speed and reliability of the electrical signal.

The Normal Brain

At its core, the brain comprises specific cells called neurons, estimated at a staggering 100 billion at birth. Neurons communicate via one-way electrical signals (nerve impulses) received by dendrites and transmitted through axons. Some neurons boast up to 100,000 dendrites, facilitating connections at an astonishing rate, possibly 1 million per second, though slowing over time. Surrounding neurons are glial cells, astrocytes, and oligodendrocytes, providing support, blood flow, nutrient exchange, and myelin production. Glial cells are estimated to match neurons in number, enhancing signal quality, speed and reliability. Myelin, a white fatty layer surrounding axons,

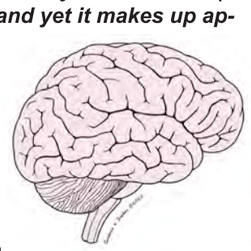


Release of neurotransmitters at the interaction between an axon and a dendrite: The molecule is released in the existing gap between the two structures and then attaches itself to the receptors of the receiving dendrite.

plays a crucial role in this process. Its function is to guarantee the quality, speed, and reliability of the electrical signal. The intricate dance of electrical signals between neurons is facilitated by neurotransmitters, which are chemicals that modulate the quality of messages transmitted.

The familiar wrinkly appearance of the brain is given by its outermost layer, called the cerebral cortex, also known as gray matter. This gets this name because it is made by the cell bodies, dendrites of the neurons, glial cells, and small blood vessels but lacks myelin, which makes most other parts of the brain appear to be white. Differently, the 'white matter' refers to the brain's deeper areas that host the majority of axons, coated with myelin.

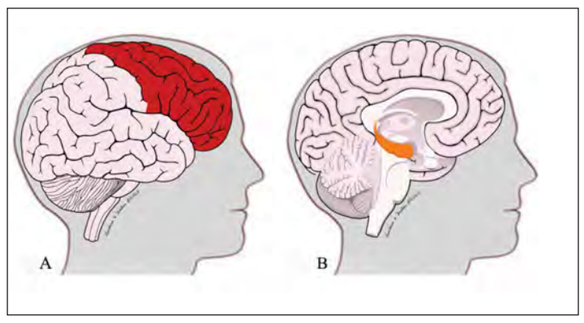
The cerebral cortex is approximately 2-4 mm thick (a stack of two or three dimes), and yet it makes up approximately 40% of the overall brain mass. The cortex is gray because nerves in this area lack the insulation that makes most other parts of the brain appear to be white. Its bumps and grooves increase its surface area by three times and enables more cerebral cortex matter to fit inside the skull.



Brain Aging

By age 6, the brain's size has reached almost 90% of its adulthood volume. But as a person journeys through life, typically starting at ages 30-40, the aging process inexorably impacts the brain. Neuronal and glial cell death leads to a gradual shrinkage of the brain, particularly affecting regions like the frontal lobe and hippocampus. Damage to the frontal lobe and hippocampus can have significant effects on cognitive function and behavior. Frontal lobe decline can lead to impairment of higher executive functions, emotional regulation, planning, reasoning, and problem-solving. The functions of the hippocampus include learning, short- and long-term memory, spatial navigation, emotional behavior, regulation of other brain areas, and production of new brain cells even in adult life.

These deficits can be compensated by taking more time to complete tasks related to these



Frontal lobe (panel A, brain surface) and hippocampus (panel B, brain sagittal section).

functions. Interestingly, even if age brings challenges, certain cognitive functions may improve. Fluid intelligence — the ability to process new information, learn, and solve problems — begins to decrease after adolescence. But it can be improved by challenging oneself, mixing up a routine, thinking creatively, and socializing regularly, all things that NeuroPong™ can provide. Crystallized intelligence — the ability to accumulate knowledge, facts, and skills throughout life — can be improved by learning a new language, acquiring a new skill (such as learning table tennis), taking new classes, or reading books.

Neuroplasticity

Despite the challenges posed by aging, the brain retains a remarkable ability to adapt and rewire itself in response to stimuli, either physical or mental, a phenomenon known as neuroplasticity. The concept behind neuroplasticity is that neurons can, under the right conditions, regenerate new connections and develop improved function in the brain or can develop workarounds for acquired deficits. In practice, there is some sort of stimulus applied, such as learning to play a piano, and then, over time, new connections sprout and they become hardwired, improving the activity. This concept is also used in traumatic brain injury or stroke rehabilitation programs to promote the development of alternate neural connections.

This rewiring happens much more robustly during the ages of brain growth and development in children, but there is some evidence that

it can occur (although in a more limited fashion) in elderly brains. Based on the concept of neuroplasticity, there also has been research into specific rehabilitative programs to try to slow down, or hopefully reverse, the more rapid neuronal death that people with neurodegenerative conditions experience. Aerobic and anaerobic exercises such as running, walking, boxing, bicycling, horseback riding and table tennis have been studied, suggesting that some of the progressive damage can be slowed with activity.

Mild Cognitive Impairment

Mild Cognitive Impairment (MCI) encompasses cognitive difficulties in areas such as language, memory, concentration, visual perception, judgment and planning. Individuals with MCI typically retain the ability to perform daily activities independently. Although MCI may not always progress, it can signify the initial stage of a neurodegenerative condition. Key facts about MCI include: around 12% to 18% of individuals aged 60 or older experience MCI; an estimated 10% to 15% of those with MCI develop dementia annually, with a third of those with MCI due to Alzheimer's disease progressing to dementia within five years; some individuals may revert to normal cognition or experience no further cognitive decline.

Currently, there is no test that can help in providing a diagnosis of MCI. Diagnosing the condition typically relies broadly on a comprehensive medical history, questionnaires, clinical examination, and a cognitive assessment. It's crucial to distinguish MCI from normal age-related cognitive changes. Individuals with MCI often exhibit poorer overall health, balance control, and increased incidences of depression, anxiety, irritability, agitation and apathy compared to those without MCI. Currently, no medications show cognitive benefits for individuals with MCI. However, recent guidelines recommend regular exercise, specifically engaging in physical activities twice a week for six months, as a potential non-pharmacological intervention to improve cognitive function in individuals with MCI. NeuroPong™ aims at providing fun, social and physical activities as a way to improve cognitive function in individuals with MCI.

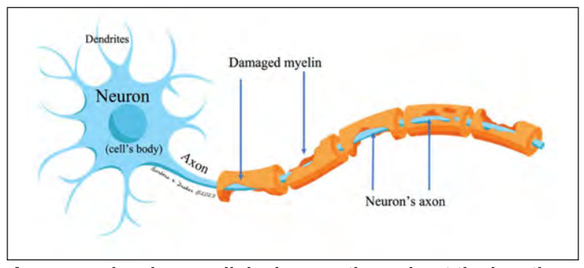
Neurodegenerative Conditions

In addition to natural aging, a spectrum of neurologic conditions arises from accelerated cell damage and death in the nervous system, all labeled "neurodegenerative conditions." These disorders share the common outcome of neural and/or glial cell death resulting in functional loss. Alzheimer's Disease (AD) and Parkinson's Disease (PD) are the most prevalent neurodegenerative conditions. Less common conditions include Multiple Sclerosis (MS), frontal lobe dementia, Amyotrophic Lateral Sclerosis (ALS), and Huntington's Disease. Currently, no cure exists for these conditions. Medical treatment primarily focuses on symptom management. Therefore, emphasizing ongoing research into understanding symptoms, pathology, and potential new treatments is crucial.

Physical exercise has been shown to have benefits for brain health, improving blood flow, neurotransmitter levels, and cognitive function. NeuroPong™ coaches can play a vital role in supporting individuals through structured training programs and mentally stimulating activities. By incorporating exercises that challenge memory, movement, attention, and executive function, the program aims at helping people maintain cognitive abilities and delay progression of conditions while also providing personal attention, physical activity, social engagement, complex cognitive stimulation — and a fun, engaging environment.

MS a result of brain signal disruption

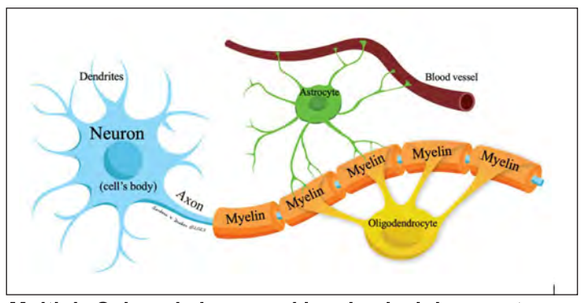
In all activities involving body movement, a complex electrical nerve network comes into play. Think of the network as the wiring in a house: if there's a problem with the breaker system or damaged wires, the signals may not reach their destination, affecting a person's ability to control their movements. Multiple Sclerosis (MS) is a condition affecting our nervous system, resulting from damage to the protective layer of nerve fibers known as myelin, leading to the disruption of signal transmissions between the brain and the body.



A neuron showing myelin's damage throughout the length of its axon. If the axon itself is spared from the damage, the brain may be able to produce new myelin (the remyelination process is provided by the oligodendrocytes). If the axon is compromised as well, the transmission of the electrical signal will be permanently interrupted.

Epidemiology

Multiple Sclerosis is a chronic inflammatory and progressive neurodegenerative condition affecting the Central Nervous System, which includes the brain, cervical and thoracic spinal cord, and optic nerve. MS affects 2.1 million worldwide, with about half of those in the U.S. About 300 new cases are diagnosed daily. It's the most prevalent neurological disease among young adults aged 20 to 40, with a female-to-male ratio of 3:1.



Multiple Sclerosis is caused by physical damage to myelin, which is a fatty protection layer surrounding nerve fibers called axons.

It's the body's own immune system that mistakenly targets and attacks myelin, disrupting normal nerve signal transmission or causing complete interruption. Myelin acts as insulation for nerve fibers, akin to electrical wire insulation, and its integrity determines the quality of electrical signals. Bodily functions such as movement, vision, hearing, speech, bladder and bowel functions, as well as thoughts and emotions, are all governed by these electrical signals. Without myelin, nerve fibers can sustain damage or become entirely severed, hindering efficient communication between the brain and the body. Myelin damage results in scar tissue formation, termed sclerosis, hence the name Multiple Sclerosis.

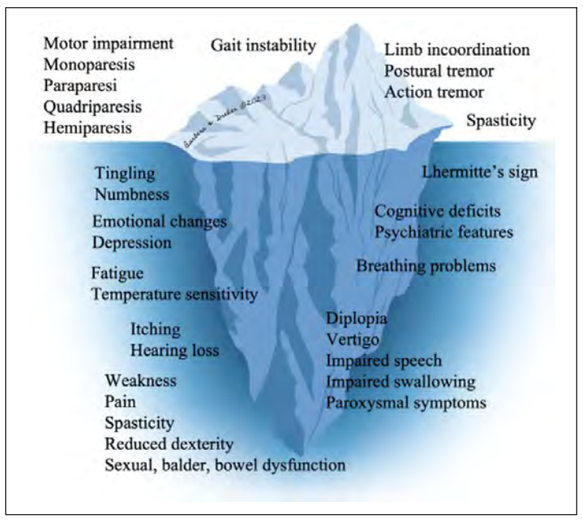
Clinical Presentation

MS symptoms vary widely, are highly unpredictable, and can fluctuate over time. Some individuals are profoundly affected, and others less so. MS often manifests with invisible symptoms — predominantly fatigue and mood swings — and those living with it face an increased risk of mental health conditions such as anxiety and depression.

The most common symptoms of Multiple Sclerosis, reported as a percentage of occurrence.

Symptoms	% occurrence
Fatigue	87
Numbness, tingling	75
Memory loss/brain fog	70
Muscle spasms	67
Heat sensitivity	64
Bladder problems	63
Pain	61
Depression	55
Anxiety	53
Foot drop	48
Vision problems	39
Sexual dysfunction	30
Hearing loss	16

Others face mobility issues like muscle spasticity and impaired balance. The complexity of MS can be likened to an iceberg, with some symptoms vis-



Multiple Sclerosis symptoms can be distinguished as visible (like what we see at the tip of an iceberg above the ocean surface) and invisible (part of the same iceberg but hiding underneath the surface).

ible above the surface and others hidden below. These symptoms can significantly impact quality of life, leading to social isolation as well as increased healthcare costs.

Gait problems are common in MS due to muscle stiffness, balance issues, weakened muscles, fatigue, dizziness, and vertigo. Inactivity worsens these issues, leading to muscle weakness, decreased bone strength, and poor posture. Fear of falling and overconfidence can further impact individuals socially and emotionally, reducing their quality of life.

Types of MS

The journey of MS varies for each person, usually marked by alternating phases of attacks and remissions. During attacks, inflammation and potential new nerve damage worsen existing symptoms or bring new ones. Remissions involve partial or complete relief of symptoms as inflammation decreases.

MS comes in four main types:

Clinically Isolated Syndrome: A single episode of symptoms lasting at least 24 hours.

Relapsing-Remitting: The most common type, marked by recurring symptom flare-ups followed by periods of improvement.

Secondary Progressive: Starts as relapsing-remitting but becomes more progressive over time.

Primary Progressive: Symptoms worsen continuously without periods of improvement.

Therefore, physical activities — such as table tennis warm-up exercises, footwork instruction, and play — should focus on improving balance, coordination, core strength, and endurance.

Fatigue

Fatigue is a pervasive symptom in MS, affecting both physical and mental energy levels. Fatigue can increase symptoms that make walking difficult, such as muscle stiffness, spasms, pain, balance issues, dizziness, and vision problems. This can lead to an increased risk of falling. NeuroPong™ instructors should be mindful of when a participant is experiencing fatigue and suggest resting or reduced activity to prevent an accidental fall.

Fatigue disrupts daily life for many with MS, but research shows exercise can help manage it. NeuroPong™ instructors should focus on improving balance, coordination, core strength, and endurance using the NeuroPong™ program's recommended exercises during table tennis warm-ups, as well as when giving footwork instruction and during game play.

Spasticity

The coordinated movements of various body parts, particularly the upper and lower limbs, rely on well-orchestrated muscle synergy. However, MS disruptions in this synergy may lead to involuntary muscle contractions, termed spasticity. Spasticity can manifest as cramps or increased muscle tone, making movements feel heavy, stiff, and challenging. Most individuals with MS will experience spasticity at some point, affecting their quality of life to varying degrees.

Diagnosis

Diagnosing MS typically involves ruling out other neurological conditions with similar symptoms and conducting a physical examination. In some cases, cerebrospinal fluid collected via a spinal tap may be analyzed for signs of infections or abnormal antibodies associated with MS. Magnetic Resonance Imaging (MRI) scans of the brain and spinal cord may reveal white spots indicating areas where myelin has been damaged.

Treatment

While there's no cure, disease-modifying drugs and other medications aim to prevent further attacks. The drugs can be administered via an IV infusion or through oral pills. Other medications can be prescribed to alleviate other symptoms associated with MS.

Exercise Therapy

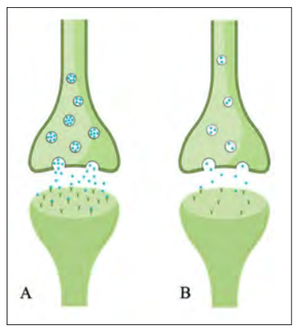
While medications and other treatments are tailored to each individual with MS, their efficacy may be limited by side effects and an inability to fully alleviate symptoms. Various interventions, including stretching, medications, Botox, relaxation techniques, therapeutic massage, physical therapy, acupuncture, cold therapy, aquatic therapy, bracing, and cannabis, can help alleviate spasticity.

Exercise and an active lifestyle are considered safe and beneficial for individuals with MS, with substantial evidence supporting their role in improving brain function and health, including regrowth of myelin, the protective layer for nerves.

NeuroPong™ helps establish a long-term fitness program focused on enhancing balance, mobility control, muscle resistance and strength, flexibility, and sensory integration, all in an enjoyable and motivating environment.

Parkinson's affects movement control

Parkinson's Disease (PD) is a chronic, progressive neurological condition impacting the planning, initiation and control of movement. With over 10 million affected globally, it's the second most common neurodegenerative condition. In the United States, about 1 million individuals live with Parkinson's, with an estimated increase to 1.2 million by 2030. Though typically affecting those over 60, approximately 4% are diagnosed before 50. While genetics may play a role in 5-10% of cases, sporadic instances arise from a mix of environmental and genetic factors. Men face a 1.5-2 times higher risk than women.

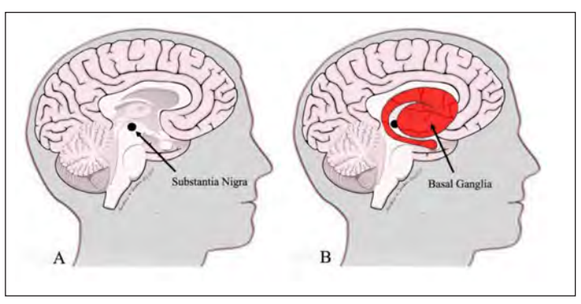


(A) Normal production of dopamine. The neurotransmitter is produced in normal quantity and there are normal receptors for it in the receiving cell. (B) Reduced production of dopamine. The neurotransmitter is produced in reduced quantity and there are, over time, fewer receptors for it in the receiving cell.

Causes

The death of the cells of the substantia nigra, as well as other areas of the brain and spinal nerves, leads to a reduction of dopamine and other neurotransmitters. The consequence of this affects both the somatic system (such as muscle movement) and autonomic system (blood pressure, nerve transmission, intestinal function, hormones, etc.), leading to motor and non-motor symptoms.

Even if the role of dopamine in enabling motor behavior is not well understood, the loss of the dopamine-containing cells leads to profound deficits in initiating, controlling and maintaining movements.



The substantia nigra (A) is a brain structure that is part of the basal ganglia (B). It is essential in controlling several functions, including movements, learning, mood, judgment and decision making.

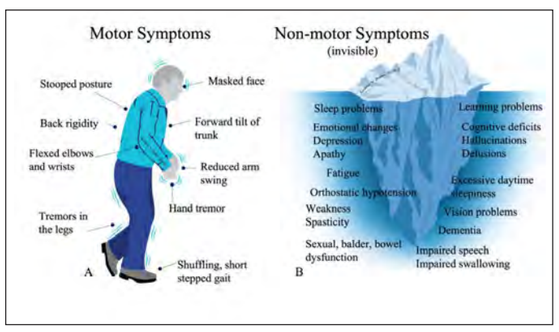
Clinical Presentation

Primary symptoms include bradykinesia (slow movements), rigidity, tremors (usually found more at rest than with activity), dystonia (involuntary and painful muscle contractions), and postural instability, often resulting in balance issues and falls, which sometimes can be fatal. Non-motor symptoms, such as cognitive impairment and mood disorders, significantly impact quality of life.

Other motor symptoms include the loss of facial expression, known as mask face; micrographia (small handwriting); loss of manual dexterity; soft speech; taking smaller and faster steps or shuffling, or difficulty swallowing. "Freezing" describes problems with initiating movements in the legs and is often described as feeling like a person's feet are stuck to the floor. It can occur when an affected person tries to walk, turns or navigates through tight and crowded spaces.

Balance control is an important priority in the NeuroPong™ program, with many of the program's exercises aimed at increasing strength, balance and control during movements at the table tennis table. Two things about people with Parkinson's to be aware of as coaches are the term retropulsion, which is a tendency to fall backward, and the term propulsion, which is the tendency to fall forward.

People with Parkinson's can also experience



(A) Motor symptoms appear only after 60%-80% of cell producing dopamine are lost.
(B) Non-motor symptoms can predate motor symptoms by many years.

varying effects to medication, including an on-off phenomenon where a person could alternate between an "on" state, where Parkinson's impairments are alleviated, and an "off" state, characterized by bradykinesia (slow movements) and rigidity.

Progression

Symptoms vary among individuals, making each case unique. There's a saying: "If you know one person with Parkinson's, you know one person with Parkinson's."

The following is a hypothetical example of the progression of PD over a course of years:

• Swinging of the right arm diminishes.

• Hands begins to curl, but can still function as needed.

• The swing of the other arm begins to decrease.

• Shorter steps become necessary.

• Posture changes, including leaning forward or stooping over.

• Tremors develop in the right hand.

• Toes turn into each other while walking.

• Knees and elbows stay bent and don't fully straighten.

• Facial appearance becomes blank and expressionless.

• Talking becomes softer and people have difficulty understanding what is being said.

• Movements become slower and slower.

Diagnosis

Diagnosing Parkinson's relies mainly on clinical assessments. Criteria focus on motor symptoms such as bradykinesia, rigidity and tremors, along with autonomic dysfunction. These symptoms also have significant overlap with other neurodegenerative processes.

Treatment

While there's no cure, nor any known intervention that may slow its progression, treatment aims to manage symptoms and improve quality of life. Medications like carbidopa/levodopa help replace dopamine, but can become less effective over time and can even increase the risk of dyskinesia.

Surgical interventions such as deep brain stimulation, which involves placing an electrode into a specified region of the basal ganglia, can provide relief in selected cases. Although not entirely understood, in well-selected cases there can be dramatic improvements in tremor, bradykinesia and rigidity, along with reduced medication needs.

Exercise therapy plays a crucial role in managing symptoms and preventing falls and is a hallmark of the NeuroPong™ program.

Balance involves complex interplay

Balance plays a critical role in human development, particularly in maintaining stability, posture and movement. It's the ability to distribute body weight to prevent tipping while standing, walking or engaging in any activity. There are two types of balance: static, or maintaining stability in a position, and dynamic, which is adjusting posture during movement. Achieving balance involves complex interactions between sensory systems, neural pathways, and muscular responses. This section explores these systems, focusing on sensory inputs, central processing, and motor outputs vital for maintaining stability.

Sensory Inputs

Balance relies on major systems including:

The vestibular system: Located in the inner ear, it detects head motion and orientation to gravity. The inner ear senses straight-line motion (back and forth, up and down) as well as rotational movements.

The visual system: Provides essential information about body position relative to the environment. Visual cues help in detecting body sway and orientation in space, especially in situations where the sensory information is contradictory or the other systems are damaged.

The proprioceptive system: Enables perception of body and limb positions in space, independent of vision. It helps a person sense the position of their fingers, arms, legs and other body parts without looking at them. This ability works both during the maintenance of static postures and during active movements. Examples of proprioception include being able to walk or kick without looking at your feet or being able to touch our nose with your eyes closed. Several NeuroPong™ exercises are designed specifically to stimulate and enhance proprioception.

Central Processing of Balance

Signals coming from the inner ear reach the brainstem (the portion of the brain that connects the cerebellum to the spinal cord), where other signals are generated and sent to neurons in the spinal cord to adjust posture and stabilize the body. The cerebellum (the portion of the brain between the cerebrum and the brain stem) receives inputs from all three systems (vestibular, visual, proprioceptive) and integrates them to regulate muscle activity and refine motor control. Lastly, higher brain regions, including the cerebral cortex, contribute to the conscious perception of balance and voluntary control of movements. These regions are involved in planning and executing complex motor tasks, such as walking on uneven surfaces or maintaining balance during athletic activities.

Motor Outputs for Balance

Efficient balance control depends on coordinated muscular responses to maintain stability and prevent falls. Muscles throughout the body, especially the trunk, legs and neck, adjust body position based on sensory inputs. Reflexes mediated by the spinal cord and brainstem provide rapid adjustments to sudden balance changes, while voluntary motor commands from the cortex and cerebellum enable precise posture adjustments.

Abnormal Proprioception

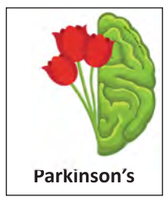
Abnormal proprioception can severely interfere with even the simplest daily activity and is responsible for balance issues, uncoordinated movements, clumsiness, poor postural control, trouble recognizing your own strength, and avoiding certain movements or activities for fear of falling.


Multiple Sclerosis

Balance and Multiple Sclerosis

People with Multiple Sclerosis may struggle with balance and experience falls due to motor neuron deterioration and compromised proprioception. Early evidence suggests a link between proprioception, cognitive functioning and fall prediction. Proprioceptive function loss may vary between MS subtypes. Loss of proprioceptive function due to MS progression or duration may happen earlier in the upper compared to the lower extremities.

Balance and Parkinson's



People with Parkinson's experience motor function decline, often affected by sensory issues like proprioceptive deficits. Visual dependency may compensate for impaired proprioception. Physical therapy is crucial for improving postural dysfunction and motor performance. Some study suggests that proprioceptive function can be enhanced in people living with Parkinson's and that this improvement translates to improved motor performance.

Physical Rehabilitation for Balance

Physical therapy targeted at balance abnormalities is effective in improving overall balance for both people living with MS and Parkinson's. While specific therapy types vary in effectiveness, rehabilitative activities that focus on balance have proven beneficial.

Activity can help with cognitive decline

Witnessing cognitive decline in a loved one is a shared experience for many. Early signs of decline, such as social withdrawal, mood changes, memory loss and unusual behavior, mark the onset of a process that can progress steadily or rapidly. Research has shown that exercise, both aerobic and anaerobic such as in playing table tennis, can help preserve cognitive function and slow its decline.

The exact cause of dementia, what triggers it, and the progression of decline remain uncertain, with the process often beginning years before symptoms appear. Individuals in their 30s may unknowingly harbor factors predisposing them to Alzheimer's. While dementia typically garners attention after age 50, emphasizing engagement in purposeful activities or healthy habits in one's 30s or 40s could potentially prevent or reduce cognitive decline.

Dementia isn't a specific condition but a collection of symptoms resulting from various brain disorders. It manifests with characteristic symptoms such as memory difficulties, language problems and challenges with problem-solving, impacting daily activities. The specific symptoms depend on the affected areas of the brain.

Dementia can affect anyone, with the risk increasing with age, although individuals under 65 may develop it (as in young onset). While the cause remains unknown in many cases, common culprits of dementia include Alzheimer's, responsible for two-thirds of cases; vascular dementia, involving blood flow; Lewy body dementia, a neurological disorder, and frontotemporal dementia, which is damage to neurons in the frontal and temporal lobes of the brain.

Full-blown dementia is often preceded by mild cognitive impairment (MCI), characterized by subtle cognitive changes that don't interfere with daily functioning. Preventing the full progression from MCI to dementia would significantly improve a person's quality of life, highlighting the importance of early intervention.

While certain risk factors such as age, genetics and family history are beyond a person's control, modifiable factors such as physical activity and social engagement play crucial roles in dementia prevention, potentially delaying up to 40% of cases.

Creating a welcoming community

Starting and running a NeuroPong™ program for individuals with neurodegenerative conditions such as Multiple Sclerosis, Parkinson's and Dementia involves learning about the conditions, recruiting participants and teaching the sport, all while creating a community of players. Most table tennis coaches are excellent teachers, but there are certain priorities for a NeuroPong™ trainer.

The Coaches

The success of NeuroPong™ starts with the coaches, who must not only have more than just basic table tennis skills, but also possess the desire to teach, a commitment to learning about neurodegenerative conditions, and a dedication to fostering an inclusive, fun and person-centered environment. Other attributes of a NeuroPong™ coach include:

• A desire to be involved.

• More than sufficient TT skill set.

• A desire and ability to teach.

• A commitment to the spirit of NeuroPong™.

• A commitment of two hours per week, twice per week, generally in the morning or early afternoon.

• A desire to be part of a community based on diversity and inclusion.

• Patience in teaching something that may be easy for a coach but not for the participants.

Dr. Barbera and the ITTF Foundation are available via Zoom or by traveling to a location to help coaches with the educational curriculum.

Recruitment

Effective recruitment of participants involves connecting with local and national organizations and support groups for people living with neurodegenerative conditions. Coaches who wish to offer the NeuroPong™ Program to people living with Multiple Sclerosis, Parkinson's, and Dementia should contact and learn about these communities. Examples:

• Approach your National Table Tennis Association. You can find their contact details here: https://directory.ittf.com/#/home

• Identify and communicate with local table tennis clubs.

• Reach out to people who played table tennis before being diagnosed.

• The local government health department might be helpful in promoting these activities.

• Residential nursing homes might house people with neurodegenerative diseases who might be interested in playing table tennis.

• Local newspapers and social media can be good channels to attract players.

A good starting point is to prepare a flyer that includes:

• The nature of the NeuroPong™ Program, its meaning, and the benefits it offers.

• Locations where the program is offered, along with dates and times (twice per week, two hours each class).

• Contact information for the person in charge of the program.

• Possible affiliations.

Distribution of the flyers should include the offices of doctors who treat neurodegenerative conditions, as well as caregivers, physical therapists, neuro-physical therapists, and occupational therapists. Utilizing local media and social media can also help attract participants.

Location

A variety of locations can provide suitable space and safety. Suggested options include:

• Table tennis clubs.

• Multisport clubs that do not yet offer table tennis.

• Local entities/organizations for Multiple Sclerosis, Parkinson's, Dementia.

• Residential nursing homes that might be interested in hosting practice sessions.

• Community programs from the government.

Table tennis clubs are usually not busy in the morning, providing an ideal time for sessions for the elderly. At any location, ensure the floor is not carpeted or uneven to help prevent falls. Each location should carry liability insurance for potential adverse events, and each partic-

ipant should sign a waiver. An area without tables should be used for warm-ups. If not possible, tables could be set up after the warm-up.

Tables should allow people in wheelchairs to safely use them. The table should be solid and stable, with locking wheels, allowing those who need it to lean on it for support. The program should provide paddles for all, but some may prefer to buy their own, especially as they improve. A small bucket of balls should be dedicated to each table. Too many balls on the floor may create a hazard. Volunteers should be recruited to help pick up balls promptly.

Welcoming Encounter

The initial interaction with participants is vital for gathering information about their physical and mental capabilities, as well as for starting to build a community. Coaches should observe participants' mobility, use of assistive devices, and overall physical condition. Interacting with both participants and their caregivers is crucial to understanding individual needs. Some things to watch:

• Is the person walking independently? If so, what is the gait: normal, shuffling, stepping?

•Is the participant using an assistive device? A cane? A crutch? A walker? A wheelchair?

• Shaking hands will give an idea of the strength of the forearm muscles and finger mobility.

• Is a caregiver present? Both the participant and caregiver are more knowledgeable than you: talk to them and listen carefully.

• Ask key questions, such as:

◦ Has the participant experienced falls, and if so, how often?

◦ What are their specific physical and mental capabilities?

◦ Are there current medications that may affect the activity?

Structure of the Class

A typical class involves:

• Welcoming participants.

• Warm-up (20-25 minutes): This is a very important part of the class. Forming a circle allows the coaches to observe, memorize, and follow up on the specific physical capabilities of each participant.

• Explanation of a specific stroke (forehand, backhand, topspin, underspin, serve, etc.). This should be seen more as a neurological exercise than a purely technical moment.

• Execution of movements (lateral, in and out of the table).

• Transition to the tables and use of the specific stroke for 15-20 minutes.

• Let participants play freely.

• Continue to monitor their play, with these criteria in mind:

◦ Safety first!

◦ Watch the control of their body parts: shoulder, elbow, wrist, legs. Challenge them to control their actions.

◦ Be aware of balance control and maintenance.

◦ Execution of backhand and forehand.

◦ Transition from forehand to backhand and vice versa.

◦ Schedule water breaks; participants may get very involved and forget to rest. Each participant will also decide independently when to rest and for how long.

Volunteers

Volunteers play a significant role in the program. They can be family member caregivers, hired caregivers, or other volunteers dedicated to the program's success and creating a supportive community. They can help set up the tables, place buckets of balls on the tables, and collect balls from the floor to avoid potential hazards.

Key Reminders

• When you've met one person with Parkinson's, you've met only one person with Parkinson's.

• No two people living with Multiple Sclerosis, even if they have the same number and location of lesions, have the same symptoms.

• We need to learn how to communicate with people living with Dementia.

Videos of different individuals and the unique approaches we established with each of them based on their specific physical and mental capabilities related to their condition start on Page 91.

NeuroPong™ founder Antonio Barbera, left, and NeuroPong™ Certified Instructor Wayne Cousineau share a light moment during a potluck social and tournament between NeuroPong™ participants in Boulder, Colo., versus NeuroPong™ participants in Ft. Collins, Colo.

NeuroPong™ helps build movement control

The NeuroPong™ Program seeks to enhance movement control through simple exercises and playing table tennis. The program emphasizes diversity, inclusion and fostering human connections. Participants are not competing for medals, but striving for a better quality of life. Every effort is celebrated and mutual support is encouraged.

Neurodegenerative conditions significantly impact the planning, control and coordination of physical activities. For individuals with these conditions, seemingly simple tasks such as a straight ball toss versus a curved one or deciding the direction and power of a shot can be challenging. Muscles may be rigid or weak; movements may lack coordination; balance and tempo might be compromised. The emotional component also plays a crucial role. While movement control is a key goal, the program's physical and social benefits keep participants motivated and coming back to play.

Table tennis enhances cardiovascular health through aerobic exercise and builds muscle endurance, improving overall strength. Additionally, it enhances flexibility by improving range of motion and aids in stability and coordination, which is crucial for maintaining balance and avoiding falls and serious injuries. Beyond the physical advantages, table tennis offers significant cognitive and emotional benefits. The game enriches lives through social engagement, which is essential for brain health. Participants enjoy the camaraderie and support, which helps combat isolation and boosts their mood, making the program a holistic approach to improving the quality of life for individuals with neurodegenerative conditions.

Neurology Considerations

The goal for participants is that any movement they make or resist is done with that individual's awareness and control. Coaches can help create this awareness by having participants feel the position of their arms and legs to know where they are, where they are supposed to move and how they are moving (or not moving), which increases proprioception, or awareness of where their body parts are in space. They should feel the engagement of core muscles and involve their vision more by concentrating on their position or movement. For example, increasing their awareness of the trajectory of a toss of a ball is beneficial to their being able to perform it. As long as the participant is aware of his or her movements and controls them, or at least attempts to control them, it will be a good day. The results will be perfect no matter what!

Participants will have different abilities at different times depending on their conditions, medication effectiveness and other factors. The following is a summary of activities affected by Multiple Sclerosis, Parkinson's, or Dementia:

• Motor planning is the ability of performing a particular action with our body, knowing the different steps to take and in which order.

• Motor control is the capability to use specific muscles for a particular task.

– Fine motor control requires small and precise movements.

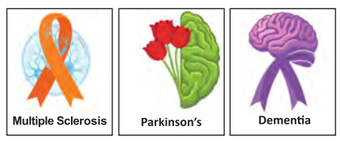
– For gross motor control, we use bigger muscle groups.

• Motor coordination is the ability to use multiple body parts at the same time for a particular action. Bilateral coordination is the ability to use both sides of the body at the same time.

• The more complicated and multitasking a physical exercise is, the more complex the motor planning, the more motor control and the motor coordination will be. All these factors may be impaired to various degrees, from mild to severe, in people living with neurodegenerative conditions.

• Each movement is the product of a perfect synchronicity between an agonist muscle (the muscle contracting) and its antagonist (the one relaxing).

The following is a summary of differences based on whether a person has Multiple Sclerosis, Parkinson's, or Dementia:

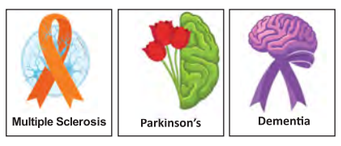


– Muscular spasticity and rigidity may affect any movement, potentially affecting the capability to even maintain the correct posture at its possible best. They affect any muscle group.

– Muscle strength may be reduced, often in a very selective way.

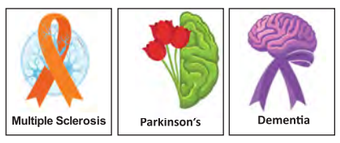
• Peripheral sensations (tactile and thermal) may be compromised.

• Proprioception may be impaired. Execution of a specific exercise may be improved by visual inspection and guidance.

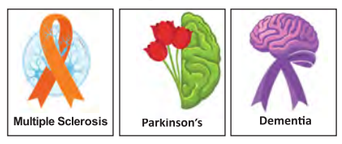


• Associating the right breathing pattern will help in focusing on the perception of the rib cage expansion (MS Hug) and the contraction and excursion of the diaphragm (the main respiratory muscle).

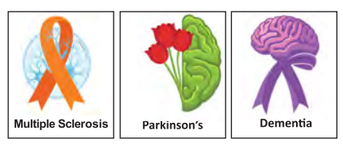
• Speed of execution may be compromised.



• Maintenance of balance relies on specific peripheral sensations and proprioceptive skills, all then involved in the engagement and orchestration of agonist and antagonist muscles.



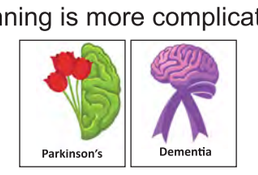
• Eyes focused on the horizon help to keep the center of the body perpendicular to the horizon, aiding in maintaining balance. Vision can be impaired in people living with neurodegenerative conditions.



• The involvement and synchronicity of limbs on both sides introduce more complexity to any exercise.

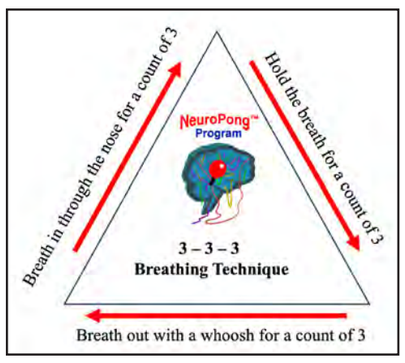
– Nerve fibers crossing the center of the brain are covered by myelin and can be compromised.

– Motor planning is more complicated.



Class Session Activities and Tips

Start sessions by forming a circle, welcoming new people and having each person introduce themselves. Include informal talk, and celebrate things like birthdays or people returning from treatments or vacations. Warm up using NeuroPong™ exercises (20-25 minutes). While still in the circle, observe and understand each participant's physical capabilities. Starting posture for exercises includes standing with feet shoulder-width apart, knees slightly bent, a neutral pelvis, engaged abdominal muscles, forward chest, shoulders aligned with the pelvis, head straight, eyes on the horizon and relaxed arms. Help ensure that movements stay within joint limits, avoiding discomfort or pain.



The program has adopted the 3-3-3 triangular breathing technique:

• Breath in through the nose for a count of 3.

• Hold the breath for a count of 3.

• Breath out with a whoosh for a count of 3.

Practice lateral movements and transitions at the table. Allow participants to play freely while maintaining safety and control. This is one of the best ways for them to develop social interactions. Observe participants' body control, balance and stroke execution.

Helpful NeuroPong™ Approaches

Since neurological symptoms vary so widely, there is no clear path of activities for coaches to avoid, only the acceptance of physical capabilities expressed by an individual participant at a particular time. The participants know their own conditions and limits, and many will want to push beyond them. Be mindful when a participant is reaching fatigue and suggest breaks such as water breaks.

Enhanced coordination is achieved through improving hand-eye coordination with exercises and table tennis play. Low-impact exercise provides a cardiovascular workout without overexertion.

Tips and benefits:

Adapted Techniques: Tailor techniques to accommodate motor symptoms like tremors and rigidity. Focus on fluid, controlled movements.

Enhanced Coordination: Table tennis improves hand-eye coordination, aiding in overcoming motor challenges.

Low-Impact Exercise: Gentle on joints and muscles, table tennis provides a cardiovascular workout without overexertion.

Social Engagement: Encourage participation in group sessions to combat isolation and boost mood.

Skill Progression: Start with basic strokes and gradually introduce more complex movements, allowing for individual pacing. Announce a table tennis skill as a theme for the day or week. Set up one table for working on that skill and rotate individuals to the table to work on it for 20 minutes or so while others are playing table tennis games, volleying or socializing. Be open to individuals coming to you to work on a specific skill.

Modified Equipment: Adjust racket grip and ball speed to match individual abilities.

Patience and Encouragement: Provide positive reinforcement and patience during skill acquisition, fostering confidence and motivation.

NeuroPong™ Decalogue of Coaching

NeuroPong™'s Decalogue of Coaching outlines key principles for effective teaching:

1. Prioritize safety.
2. Observe participants from head to toe.
3. Learn from participants and listen to them. Learn to speak their language.
4. Pay attention to the entire body, not just the visible parts above the table.
5. Do not rush.
6. Demonstrate clean, precise shots.
7. Encourage controlled movements. Movement control is a hallmark goal of the NeuroPong™ program.
8. Adapt to each participant's unique way of understanding instructions.
9. Communicate effectively.
10. Have fun!

The first rule of NeuroPong™? Have FUN!

Neck Rotation

Click to see Variations

Execution

• Starting posture.

• Bend the neck forward, moving the chin close to the chest.

• Start rotating the head toward the right, clockwise.

• Relax the muscles on the right side of the neck; feel the muscles on the left side of the neck stretching.

• Continue rotating the head, extend it toward the back.

• Once the head reaches the left shoulder, relax the muscles on the left side of the neck; feel the muscles on the right side of the neck stretching.

• Finish the head rotation where it started, with the chin close to the chest.

Breathing

• Breathe in at the beginning of the exercise, when the chin is close to the chest. This is associated with the expansion of the rib cage.

• Stop breathing in when the head is 2/3 of the way up and

hold the breath until it is 1/3 back.

– Start breathing out and stop when the chin is back to its starting
point. This is associated with the relaxation of the rib cage as well.

– Repeat it 3-5 times.

• Do the same exercise starting the rotation of the head toward the left, counter clockwise, and repeat the steps above.

– Repeat it 3-5 times.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

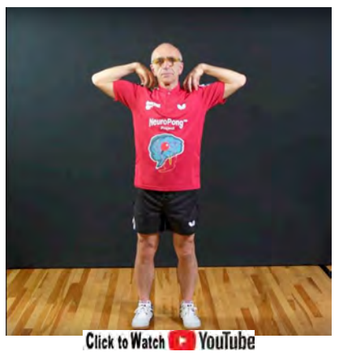
• Keep the eyes open to avoid dizziness.

• Do not let the shoulders fold forward.

• Be sure not to shrug the shoulders.

Shoulder Rotation

Click to see Variations



Execution

Arms Straight

• Starting posture.

• Lift both arms up the sides of the torso so you look like a T.

• Palm of the hands are facing down.

• Do not shrug the shoulders.

• Move the arms forward and upward, in a circular motion.

• Hands are drawing a circle with their fingertips.

• Circles made can go from small, to medium, to large.

Breathing

• Breathe in at the beginning of the exercise, as the arms are moving forward and upward.

• This is associated with the expansion of the rib cage.

• Stop breathing in when the fingertips (or elbows) are 2/3 of the way up and hold the breath until the fingertips (or elbows) are 1/3 of the way down.

• Start breathing out and stop when the hands get back to their starting point. This is associated with the relaxation of the rib cage as well.

• Repeat it 3-5 times.

• Do the same exercise starting the rotation of the arms going downward and backward and repeat the steps above.

• Repeat it 3-5 times.

Hands on shoulders

• Starting posture.

• Place each hand on its respective shoulder.

• This will produce a flexion of the forearms.

• Keeping the forearms flexed, lift up the elbows so you look like a small “t.”

• Do not shrug the shoulders.

• Move elbows forward and upward, in a circular motion.

• Elbows are drawing a circle at each side.

• Circles made can go from small, to medium, to large.

• Repeat the exercise 3-5 times.

• Do the same exercise starting the rotation of the elbows going downward and backward and repeat the steps above.

• Repeat the exercise 3-5 times.

What not to do

• Do not shrug the shoulders.

Key points

• Do not rush.

• Only move within the limits of the shoulders joint, without causing discomfort or pain.

• Make sure to follow the breathing pattern.

• Keep the eyes open to avoid dizziness.

• Keeping the arm extended may be tiring for some participants. If this is the case, move to the shoulder rotation with hand on the shoulder version.

Puppet

Click to see Variations

Execution

• Starting posture.

• Raise the elbows out to the side of the torso, with the fingertips pointing downward and palm facing down. Imagine a puppet whose elbows are lifted up by the puppeteer's strings.

• Raise the right forearm; the right palm will face forward.

• Do not shrug the shoulders.

• Lower the right forearm.

• Raise the left forearm; the left palm will face forward.

• Lower the left forearm.

• Alternate the forearms in a way that when one goes up, the other one goes down.

Breathing

• Inhale when one of the forearms goes up.

• This is associated with the expansion of the rib cage.

• Exhale when the same forearm goes down.

• This is associated with the relaxation of the rib cage as well.

• Repeat it 3-5 times (each cycle encompasses both forearm going up and coming down).

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• Keep the eyes open to avoid dizziness.

What not to do

• Do not shrug the shoulders.

Wrist Rotation

Click to see Variations

Execution

- Starting posture.
- Flex both forearms, with elbows resting at the sides of the torso.
- Palms are facing each other.
- Interlock fingers.
- Rotate with the right wrist going forward as the left one is going backward.
- Repeat this full cycle rotation 3-5 times.
- Reverse the direction of the rotation, moving the left wrist forward as the right one is going backward.
- Repeat this full cycle rotation 3-5 times.

Key points

- Do not rush.
- Keep the eyes open to avoid dizziness.
- Make sure elbows are always resting at the sides of the torso.

What not to do

- Make sure only the wrists are engaged, unless instructions allow to engage part of or all upper extremities.

Spider on Mirror

Click to see Variations

Execution

• Starting posture.

• Flex both forearms, with elbows resting at the sides of the torso.

• Palms are facing upward first.

• Rotate the palms to face each other.

• Bring the fingertips of one hand to touch its mate of the other hand (i.e. thumb to thumb, index to index, middle to middle, ring to ring, pinky to pinky).

• Bring palms and wrists together.

Key points

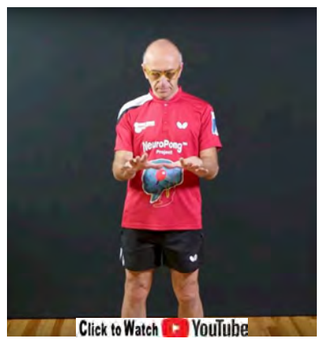
• Do not rush.

• Keep the eyes open to avoid dizziness.

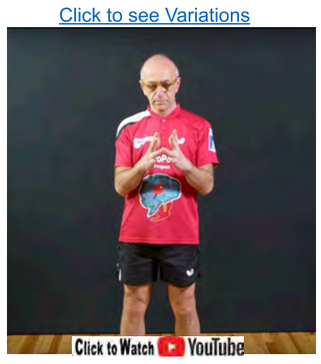
• Some may need to use their eyes to make sure the fingertips of one hand can find their mates.

• Make sure to underline that it is from the inward movements of the wrists that the palms will touch each other's entire surface.

Finger Mates



Click to see Variations



Execution

Palms up

• Starting posture.

• Flex both forearms, with elbows resting at the sides of the torso.

• Palms are facing upwards.

• Make pinky's fingertip touch its mate of the other hand.

• While holding pinky fingertips together, bring right ringer fingertip to left ringer fingertip.

• Continue to bring the fingertips of one hand to its mate on the other hand sequentially, keeping the previous ones always touching each other.

• Continue in this manner until all finger tips of one hand are touching their mates on the other hand.

• Repeat the exercise several times.

Palms Down

• Starting posture.

• Flex both forearms, with elbows resting at the sides of the torso.

• Palms are facing downward.

• Make thumb's fingertip touch its mate of the other hand.

• Keep the thumb's fingertips together.

• While holding thumb's fingertips together, bring right index fingertip to left index fingertip.

• Continue to bring the fingertips of one hand to its mate on the other hand sequentially, keeping the previous ones always touching each other.

• Continue in this manner until all finger tips of one hand are touching their mates on the other hand.

• Repeat the exercise several times.

Palms Neutral

• Starting posture.

• Flex both forearms, with elbows resting at the sides of the torso.

• Palms are facing each other.

• Make pinky's fingertip touch its mate of the other hand.

• While making ringer's fingertip touch its mate, release the contact between the pinkies fingertips.

• Continue to bring the fingertips of one hand to its mate on the other hand sequentially, releasing the contract between the previous fingertips, from pinkies to thumbs.

• Reverse the direction of the contacts going from thumbs to pinkies, following the rule explained above.

Repeat the exercise several times.

Key points

• Do not rush.

• Some need to use their eyes to make sure the fingertips of one hand can find their mates.

• Make sure to underline that it is from the inward rotation of the elbow (from full supination to neutral position) that the ring and other fingertip will be able to touch their mates.

• Remember to release the contact of fingertips sequentially once the contact of the following fingertips has been established (palm neutral).

• Make sure to underline to keep palms close to each other (palm neutral).

Pelvis Rotation

Execution

• Starting posture.

• Place both hands on the hips.

• Start rotating the pelvis moving the left hip forward and continuing the rotation in a clockwise direction.

Breathing

• Breathe in at the beginning of the rotation, as the left hip moves forward.

• This is associated with the expansion of the rib cage.

• Stop breathing in when the hips are at 2/3 of the way into the rotation going forward and hold the breath until they are 1/3 of the way into the rotation going backward.

• Start breathing out and stop when the left hip gets back to its starting point. This is associated with the relaxation of the rib cage as well.

• Repeat the exercise 3-5 times.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• If needed, make sure the contraction of the abdominal muscles can be felt and appreciated with the hands.

• Make sure there is a transfer of body weight from one leg to the other.

• Keep the eyes open to avoid dizziness.

• Keep shoulder straight and chest forward.

Knee Lifts

Execution

• Just the knee

• Starting posture.

• Feet closer than shoulder-width apart.

• Before lifting the right leg, transfer body weight onto the left leg.

• Lift the right knee at about 90 degrees, keeping the lower back straight and the chest forward.

• Bring the right foot back to the floor.

• Progressively increase the time the right foot stays off the floor.

• Breathe in when lifting the right leg, breathe out when bringing it back to the floor.

• Repeat the exercise 3-5 times.

• Repeat the exercise 3-5 times lifting the left knee.

With same side hand tap

• Starting posture.

• Feet closer than shoulder width apart.

• Before lifting the right leg, transfer body weight onto the left leg and make sure it is providing the necessary support.

• Lift the right knee at about 90 degrees, keeping the lower back straight and the chest forward.

• Tap the right knee with the palm of the right hand.

• Bring the right foot back to the floor.

• Progressively increase the time the right foot stays off the floor.

• Breathe in when lifting the right leg, breathe out when bringing the right foot back to the floor.

• Repeat the exercise 3-5 times.

• Repeat the exercise 3-5 times lifting the left knee and tapping it with the palm of the left hand.

Execution

With opposite side hand tap

• Starting posture.

• Close the stand, with feet closer than shoulder width apart.

• Before lifting the right leg, transfer body weight onto the left leg and make sure it is providing the necessary support.

• Lift the right knee at about 90 degrees.

• Rotate and bend the trunk toward the right side, performing an abdominal crunch and tapping the right knee with the palm of the left hand.

• Bring the right foot back to the floor.

• Progressively increase the time the right leg stays off the floor.

• Breathe in when lifting the right leg, breathe out when bringing the right foot back to the floor.

• Repeat the exercise 3-5 times.

• Repeat the exercise 3-5 times lifting the left knee, rotating and bending the trunk toward the left side, performing an abdominal crunch, and tapping the left knee with the palm of the right hand.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• Make sure the contraction of the abdominal muscles could be felt.

• Keep the eyes open to avoid dizziness.

• Arms may be lifted like a T to gain balance.

• At the beginning, foot is lifted progressively.

• Time and repetition of this exercise will increase trust on the standing leg.

Hip Rotation

Execution

Front to side

• Starting posture.

• Close the stand, keeping the feet together.

• Before lifting the right leg, transfer body weight onto the left leg and make sure it is providing the necessary support.

• Lift the right knee at about 90 degrees.

• Rotate the right hip to the right side, keeping the knee flexed at 90 degrees.

• Bring the right foot to the ground.

• Breathe in when lifting the right leg, hold the breath while rotating the hip, breathe out when bringing the right foot back to the floor.

• Repeat the exercise 3-5 times.

• Repeat the exercise 3-5 times lifting the left knee and rotating the left hip to the left side.

Side to front

• Starting posture.

• Close the stand, keeping the feet together.

• Before lifting the right leg, transfer body weight onto the left leg and make sure it is providing the necessary support.

• Rotate the right hip to the right and lift up the knee at about 90 degrees.

• Rotate the right hip to forward.

• Bring the right foot to the ground.

• Breathe in when rotating the right leg to the right, hold the breath while rotating the hip forward, breathe out when bringing the right foot back to the floor.

• Repeat the exercise 3-5 times.

• Repeat the exercise 3-5 times rotating the left knee to the front.

Variation

• Before lifting up the leg, place hands one on top of each other, palms facing down, 4-6 inches in front of the chest for better balance control.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• If needed, make sure the contraction of the abdominal muscles could be felt and appreciated with the hands.

• Keep the eyes open to avoid dizziness.

• At the beginning, foot is lifted progressively, as per each personal comfort and ability.

• Time and repetition of this exercise will increase the trust on the standing leg.

• The time a leg stays off the floor relies on the sensations coming from the standing leg and its different parts providing confidence and balance.

• If needed, variation 2 may be performed for better balance control.

Butt Kick

Execution

• Starting posture.

• Close the stand, keeping the feet together.

• Before bending the right leg, transfer body weight onto the left leg and make sure it is providing the necessary support.

• Bend the right leg at the knee, bringing the right heel toward the right butt.

• Try to touch the right butt with the right heel.

• If this is not possible, touch the heel with the right hand (variation).

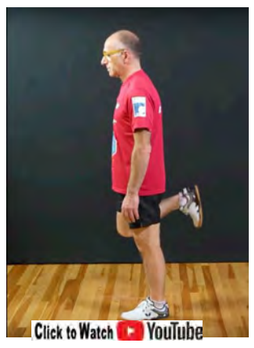
• Engage abdominal muscles to keep balance.

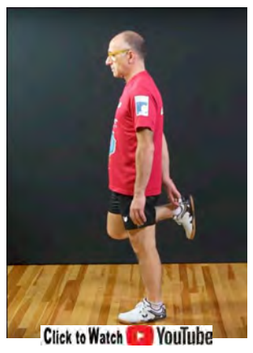
• Bring right foot back to the ground.

• Breathe in while bending the leg, breathe out while bringing the foot back to the ground.

• Before bending the left leg, transfer body weight onto the right leg and make sure it is providing the necessary support.

• Bend the left leg at the knee, bringing the right heel toward the right butt.





• Try to touch the right butt with the right heel.

• If this is not possible, touch the heel with the right hand (variation).

• Engage abdominal muscles to keep balance.

• Bring right foot back to the ground.

• Breathe in while bending the leg, breathe out while bringing the foot back to the ground.

• Repeat the exercise 3-5 times.

• If comfortable, continue to alternate right and left heels, picking up the pace gradually until it feels like jogging in place.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• If needed, make sure the contraction of the abdominal muscles could be felt and appreciated with the hands.

• Keep the eyes open to avoid

Airplane Balance

Execution

• Starting posture.

• Close the stand, keeping the feet together.

• Lift both arms up the sides of the torso: you will look like a T.

• Palm of the hands are facing down.

• Before lifting the right leg, transfer body weight onto the left leg and make sure it is providing the necessary support.

• Let the right foot come off the ground and pull the leg backward, without bending the knee.

• At the same time bend the torso forward, looking 4-5 feet away on the ground.

• Come back to the neutral position (feet together, torso straight).

• Do not place right foot on the ground.

• Now swing right leg forward and move the torso backward.

• Left leg is slightly bending.

• Breathe in when pulling the leg backward, hold the beath while in the neutral position and breathe out while swinging the leg forward.

• Repeat the exercise 3-5 times.

• If possible, swing right leg forward and go up and down on the left leg.

• Repeat the exercise 3-5 times standing on the right leg.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• Keep the eyes open to avoid dizziness.

• The swing amplitude is subjective.

• Time and repetition of this exercise will increase the trust on the standing leg.

• The time a leg stays off the floor relies on the sensations coming from the standing leg and its different parts providing confidence and balance.

Ankle Rotation

Execution

Left Ankle + wrists

• Starting posture.

• Close the stand, keeping the feet together.

• Before bending the left leg, transfer body weight onto the right leg and make sure it is providing the necessary support.

• Bend left leg at the knee and lift up the heal, keeping only the toes touching the ground.

• Rotate the left ankle clockwise (going outward with the knee), pivoting on the right toes.

• Breathe in and out freely.

• Rotate the ankle 3-5 times.

• Now, bend the forearms and make the palms of the hands facing each other. Interlock fingers and, while rotating the right ankle clockwise, rotate wrists going forward.

• Rotate ankle and wrist together 3-5 times.

Right Ankle + wrists

• After repositioning the left foot on the ground, transfer body weight onto the left leg and make sure it is providing the necessary support.

• Bend the right leg at the knee and lift up the heal, keeping only the toes touching the ground.

• This time rotate the right ankle counter clockwise (going inward with the knee), pivoting on the left toes.

• Breathe in and out freely.

• Rotate the ankle 3- 5 times.

• Now, bend the forearms and make the palms of the hands facing each other. Interlock fingers and, while rotating the right ankle counter clockwise, rotate wrists going backward.

Rotate ankle and wrist together 3-5 times.

Key points

• Do not rush.

• Breath freely.

• Keep the eyes open to avoid dizziness.

• Make sure only the ankles and subsequently only ankle and wrists are involved in the execution of the exercise.

Lunges

Execution

Lunge right leg, right arm reach and left arm reach

• Starting posture.

• Lunge forward with right leg.

• Breathe in while standing and breathe out when lunge starts.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

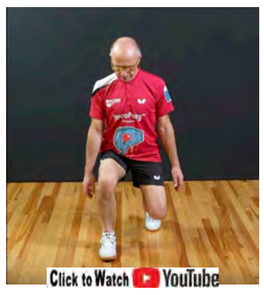
• Starting posture.

• Lunge forward with right leg and right arm.

• Knee and elbow lunge at the same time.

• Breathe in while standing and breathe out when lunge starts.

• Keep arm on the side, outside the body's frame.



• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

Lunge left leg, left arm reach and right arm reach

• Starting posture.

• Lunge forward with left leg.

• Breathe in while standing and breathe out when lunge starts.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push left leg back to the starting position.

• Repeat the exercise 3-5 times.

• Starting posture.

• Lunge forward with left leg and left arm.

• Knee and elbow lunge at the same time.

• Breathe in while standing and breathe out when lunge starts.

• Keep arm on the side, outside the body's frame.

Pronation and Supination

Click to see Variations

Execution

• Starting posture.

• Keep ball in one hand.

• Flex both forearms, with elbows resting at the sides of the torso.

• Palms are facing up.

• Move both forearms inward, converging toward body's midline.

• Pronate (palm facing down) right hand and let the ball go into the left hand, which is supinating now (palm facing up) to accept the ball.

• In catching the ball with the left hand, make sure all fingertips can feel the ball's surface.

• Pronate left hand and let the ball go into the right hand that is supinating now to accept the ball.

• In catching the ball on the right hand, make sure all fingertips can feel the ball's surface.

• Repeat the exercise 3-5 times per cycle (pronation and supination).

• The distance between the forearms can increase.

• The same exercise can also be performed with the elbows not directly touching the torso.

• The same exercise can be also performed with extended arms in front of the body.

Key points

• Do not rush.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without overlapping.

• Make sure to have a visualization of the ball in the receiving hand.

Hoop, Hips

Execution

• Starting posture.

• Hold a hula hoop in one of your hands (hula hoop diameter of 26 inches).

• Pass the hoop above your head, hold it with both hands in the front (palms facing down) and extend the forearms. This will move the hoop down to the level of the elbows and in contact with the back at the same level.

• Bend your chest forward and bend the knees, making sure the body weight will be transferred to the ball of the feet.

• Rotate the pelvis toward the right and transfer the body weight from the left to the right leg.

• The left leg is pivoting on the ball of the foot.

• Rotate the pelvis back in a straight position.

• Breathe in when rotating

to the side, hold the breath for one second and then breathe out while rotating back to the straight position.

• Repeat the exercise 3-5 times.

• Now, rotate the pelvis toward the left and transfer the body weight from the right to the left leg.

• The right leg is pivoting on the ball of the foot.

• Rotate the pelvis back in a straight position.

• Repeat the exercise 3-5 times.

Key points

• Do not rush.

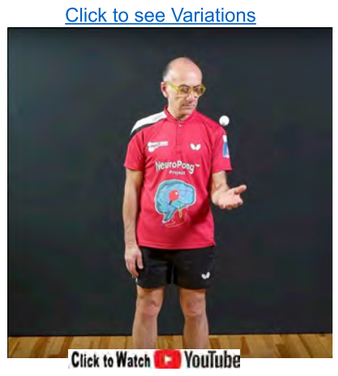
• Make sure to follow the breathing pattern.

• Make sure body weight is transferred to the ball of the feet.

• Make sure body weight transfer is happening from one leg to the other during the rotation of the pelvis.

Tossing

Click to see Variations



Execution

Movements without ball

• Starting posture.

• Flex left forearms at 90 degrees, with elbow resting at the sides of the torso.

• Palm is facing up.

• Move left forearm inward, converging toward the body's midline.

• Flex and extend elbow in this position.

• With elbow still flexed 90 degrees, move left forearm straight in front of the body.

• Flex and extend elbow in this position.

• With elbow still flexed 90 degrees, move left forearm outward, diverging toward the left of the body.

• Flex and extend elbow in this position.

Ball in hand

• Now, place ball in the left hand and toss it up straight up with the forearm in the converging, straight and diverging position.

• The ball is caught with the palm facing up.

• Perform the exercise 3-5 times in each position (converging, straight and diverging forearm).

• Switch hand and repeat the exercise 3-5 times.

Key points

• Do not rush.

• Make sure to control direction and power of the toss.

• At the beginning, toss can be only a few inches.

• Increase the height of the toss per individual capacity.

• Make sure the catching hand will not reach for the ball, waiting instead for it to come down to the height of the starting point.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Make sure to have a visualization of the ball in the receiving hand.

Elevator

Click to see Variations

Execution

Movements without ball

• Starting posture.

• Flex both forearms at 90 degrees, with elbow resting at the sides of the torso.

• Palms are facing up.

• Move both forearms inward, converging toward the body's midline.

• Flex and extend elbows alternatively in this position, paying attention to not overlap the hands.

• With elbow still flexed 90 degrees, move both forearms straight in front of the body.

• Flex and extend elbows alternatively in this position.

• With elbows still flexed 90 degrees, move both forearms outward, diverging toward each respective part of body.

• Flex and extend elbows alternatively in this position.

Ball in hand

• Now, place the ball in one hand and converge the forearms.

• Toss the ball up with one hand on a straight trajectory and catch it with the other hand.

• Repeat the exercise 3-5 times, alternating the tossing and catching hand, making sure the toss follows a straight trajectory in front of the midline of the body, without allowing the hands to overlap.

• With elbows still flexed 90 degrees, move both forearms straight in front of the body.

• Toss the ball up with one hand toward the other hand, this time making a curve trajectory and grab it with the other hand.

• Repeat the exercise 3-5 times, alternating the tossing and catching hand, making sure the toss follows a curve trajectory from one side of the body.

• With elbows still flexed 90 degrees, diverge both forearms outward.

• Under toss the ball with the left hand toward the right side, with the arm crossing in front of the body.

• While doing this, rotate the pelvis toward the right and transfer the body weight from the left to the right leg.

• The left leg is now bent, pivoting on the ball of the foot.

• Catch the ball with the right hand, palm facing up, while the entire arm is diverging toward the right.

• Follow the same steps tossing the ball with the right hand and catching it with the left one palm up.

• Repeat the exercise 3-5 times, alternating the tossing and catching hand, making sure the trajectory of the toss allows transfer of body weight from one leg to the other.

Key points

• Do not rush.

• Make sure to control direction (straight, curve, side to side) and power of the toss.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

Make sure to initiate the hip rotation at the time of the toss (diverging variation).

Make sure body weight transfer is happening (diverging variation).

Make sure the catch of the ball is far enough from the body to stimulate an appropriate weight transfer on the same side of the catch (diverging variation).

Crocodile

Click to see Variations

Execution

Movements without the ball

• Starting posture.

• Flex both forearms at 90 degrees, with elbow resting at the sides of the torso.

• Tuck both elbows in and flex forearm at 90 degrees.

• Left hand is facing up and right hand is facing down.

• Move forearms inward, converging toward the body's midline.

• Left hand stays under right hand and they start moving up and down toward each other, acting like the mouth of a crocodile.

• With elbow still flexed 90 degrees, move both forearms straight in front of the body.

• Flex and extend elbow alternatively in this position, left hand facing up and right hand facing down.

• With elbows still flexed 90 degrees, move both forearms outward, diverging toward each respective part of body.

• Flex and extend elbow alternatively in this position, left hand facing up and right hand facing down and vice versa.

Ball in hand

• Place the ball in one hand and converge the forearms.

• Toss the ball up on a straight trajectory with the left hand (palm facing up) and grab it with the right hand (palm facing down).

• Repeat the exercise 3-5 times, alternating the tossing and grabbing hand, making sure the toss follows a straight trajectory in front of the midline of the body, without allowing the hands to overlap.

• With elbows still flexed 90 degrees, move both forearms straight in front of the body.

• Under-toss the ball up with the left hand (palm facing up) toward the right hand, with the arm crossing in front of the body.

• Catch the ball with the right hand facing down.

• Repeat the exercise 3-5 times.

• With elbows still flexed 90 degrees, diverge both forearms outward.

• Under toss the ball with the left hand toward the right side, with the arm crossing in front of the body.

• While doing this, rotate the pelvis toward the right and transfer the body weight from the left to the right leg.

• The left leg is now bent, pivoting on the ball of the foot.

Catch the ball with the right hand, palm facing down, while the entire arm is diverging toward the right.

• Follow the same steps tossing the ball with the right hand and catching with the left one palm down.

• Repeat the exercise 3-5 times, alternating the tossing and grabbing hand, making sure the trajectory of the toss allows transfer of body weight from one leg to the other.

Key points

• Do not rush.

• Make sure to control direction (straight, curve, side to side) and power of the toss.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Make sure the ball stays within the "jaws" of the crocodile.

• Make sure to initiate the hip rotation at the time of the toss (diverging version).

• Make sure body weight transfer is happening (diverging version).

• Make sure the catch of the ball is far enough from the body to stimulate an appropriate weight transfer on the same side of the catch (diverging variation).

Forearm Catapult

Click to see Variations

Execution

• Starting posture.

• Rotate the left arm so the palm is facing forward.

• Fully flex the forearms.

• The palm stays in the same position.

• Once hand is at the shoulder, rotate elbow so left palm is facing down.

• Fully extend the forearm, with palm facing down during the entire extension.

• At full extension, rotate elbow so left palm is facing up again.

• Perform a few flexions and extensions of the forearm, making sure to rotate palm up at the beginning of the flexion and palm down at the beginning of the extension.

• Now, place ball in the left hand.

• Toss the ball up during the flexion (palm facing up).

• Catch the ball during the extension (palm facing down).

• Keep the elbow at the side of the body during the entire execution.

• Repeat the exercise using the right arm.

Variation

• Perform the exercise with elbow away from the torso.

Key points

• Do not rush.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Make sure to have a visualization of the ball in the receiving hand.

• The toss needs to be controlled to keep the ball lower than shoulder height.

Hand Scissors

Click to see Variations

Execution

• Starting posture.

• Lift the arms in a way that hands will be 4-6 inches in front of the chest, with palm facing down.

• Place a ball in the gap between the index and middle finger of the right hand, at the level of the tips of the fingers, as if holding it at the tip of a scissors.

• Rotate right hand so its palm is facing down.

• Grab the ball with the left hand (palm still facing you) between the index and middle finger and rotate it so its palm is facing down.

• Rotate right hand (without ball) so palm faces you.

• Grab the ball with the right hand between its middle and ring finger and rotate it so its palm is facing down.

• Rotate left hand (without ball) so palm faces you.

• Grab the ball with the left hand between its middle and ring finger and rotate it so its palm is facing down.

• Rotate right hand (without ball) so palm faces you.

• Grab the ball with the right hand between its ring and little finger and rotate it so its palm is facing down.

• Rotate right hand (without ball) so palm faces you.

• Grab the ball with the left hand between its ring and little finger and rotate it so its palm is facing down.

• Bring the ball back to the starting point (between the index and middle finger of the right hand) passing it from one gap of the adjacent fingers to the other, rotating hands in the same fashion: the feeding hand is presenting the ball to the other hand with its palm facing down and the grabbing hand does so with its palm facing you.

Variation

• Perform the same exercise changing the direction of rotation of the feeding hand, which now will rotate palm facing up.

Key points

• Do not rush.

• Make sure the ball is grabbed by the fingertips.

• Make sure to feel the pressure of the fingers grabbing the ball before releasing the pressure of the fingers holding the ball.

Lunge with Toss in Air Left Leg

Execution

Left leg

Left hand facing up

• Starting posture.

• Keep ball in the left hand.

• Lunge forward with right leg and left arm.

• Breathe in while standing and breathe out when lunge starts.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward with left hand, palm facing up, aiming at a spot on the left side of the body as far forward as the right foot is landing.

• Catch the ball with left palm facing up.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

Left leg

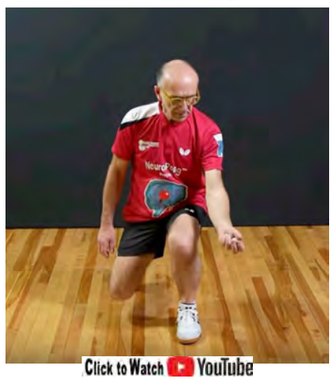
Left hand facing down

• Starting posture.

• Keep ball in the left hand.

• Lunge forward with right leg and left arm.

• Breathe in while standing and breathe out when lunge starts.



• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward with right hand, palm facing down, aiming at a spot on the left side of the body as far forward as the right foot is landing.

• Catch the ball with left palm facing down.

• Once in this position, make sure the abdominal wall muscles are engaged.

• Push right leg back to starting position.

• Repeat the exercise 3-5 times.

Left leg

Right hand facing up

• Starting posture.

• Keep ball in the left hand.

• Lunge forward with left leg and right arm.

• Breathe in while standing and breathe out when lunge starts.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward with right hand, palm facing up, aiming at a spot on the right side of the body as far forward as the left foot is landing.

• Catch the ball with right palm facing up.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

Left leg

Right arm facing down

• Starting posture.

• Keep ball in the left hand.

• Lunge forward with left leg and right arm.

• Breathe in while standing and breathe out when lunge starts.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball for-

MORE

Lunge with Toss in Air Left Leg

ward with right hand, palm facing down, aiming at a spot on the right side of the body as far forward as the left foot is landing.

• Catch the ball with right palm facing down.

• Once in this position, make sure the abdominal wall muscles are engaged.

• Push right leg back to starting position.

• Repeat the exercise 3-5 times.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• Keep the eyes open to avoid dizziness.

• Make sure to control direction and power of the toss.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Be aware of all sensations coming from different part of the body working together to allow balance acquisition and maintenance (foot, knee, leg, glutes, abdominal wall muscles).

• Once the foot lands, make sure the knee stays on top of the heel and does not reach nor overpass the toes (lower leg should be perpendicular to the ground).

• Make sure the arm swings outside the body frame.

• Lunging leg: make sure the knee is lined up with the hip and the foot.

• Back leg: makes sure the hip, knee and foot are lined up, facing forward.

• Weight is on the ball of the foot.

• Make sure the arm swings outside the body frame.

Lunge with Toss in Air Right Leg

Execution

Right leg

Right hand facing up

• Starting posture.

• Keep ball in the right hand.

• Lunge forward with **right leg** and **right arm**.

• Breathe in while standing and breathe out when lunge starts.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward with right hand, **palm facing up**, aiming outside of where the right foot is landing.

• Catch the ball with right palm facing up.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

Right leg

Right hand facing down

• Starting posture.

• Keep ball in the right hand.

• Lunge forward with right leg and right arm.

• Breathe in while standing and breathe out when lunge starts.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward with right hand, **palm facing down**, aiming at the place where the right foot is landing.

• Catch the ball with right palm facing down.

• Once in this position, make sure the abdominal wall muscles are engaged.

• Push right leg back to starting position.

• Repeat the exercise 3-5 times.

Right leg

left hand facing up

• Starting posture.

• Keep ball in the left hand.

• Lunge forward with right leg and left arm.

• Breathe in while standing and breathe out when lunge starts.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward with left hand, palm facing up, aiming at a spot on the left side of the body as far forward as the right foot is landing.

• Catch the ball with left palm facing up.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

Right leg

left hand facing down

• Starting posture.

• Keep ball in the left hand.

• Lunge forward with **right leg** and **left arm**.

• Breathe in while standing and breathe out when lunge starts.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward with right hand, **palm facing down**, aiming at a spot on the left side of the body as far for-

MORE

Lunge with Toss in Air Right Leg

ward as the right foot is landing.

• Catch the ball with left palm facing down.

• Once in this position, make sure the abdominal wall muscles are engaged.

• Push right leg back to starting position.

• Repeat the exercise 3-5 times.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• Keep the eyes open to avoid dizziness.

• Make sure to control the direction and power of the toss.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Be aware of all sensations coming from different parts of the body working together to allow balance acquisition and maintenance (foot, knee, leg, glutes, abdominal wall muscles).

• Once the foot lands, make sure the knee stays on top of the heel and does not reach nor overpass the toes (lower leg should be perpendicular to the ground).

• Make sure the arm swings outside the body frame.

• Lunging leg: make sure the knee is lined up with the hip and the foot.

• Back leg: makes sure the hip, knee and foot are lined up, facing forward. Weight is on the ball of the foot.

• Make sure the arm swings outside the body frame.

Lunge with Straight Bounce Left Leg

Execution

Left leg

Left hand facing up

• Starting posture.

• Keep ball in the left hand.

• Lunge forward with left leg and left arm.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward to the ground with left hand, palm facing up, aiming at the place outside of where the left foot is landing.

• Let the ball bounce and then catch it with left palm facing up.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push left leg back to the starting position.

• Repeat the exercise 3-5 times.

Left leg

Left hand facing down

• Starting posture.

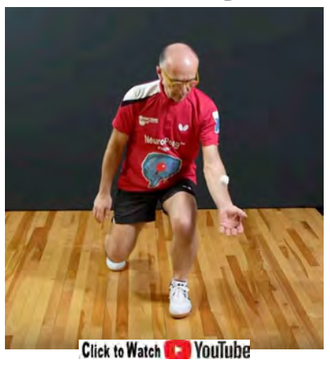
• Keep ball in the left hand.

• Lunge forward with left leg and left arm.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is



happening, toss the ball forward to the ground with left hand, palm facing down, aiming at the place outside of where the left foot is landing.

• Let the ball bounce and then catch it with left palm facing down.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push left leg back to the starting position.

• Repeat the exercise 3-5 times.

Left leg

Right hand facing up

• Starting posture.

• Keep ball in the right hand.

• Lunge forward with left leg and right arm.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward to the ground with right hand, palm facing up, aiming at a spot on the right of the body as far forward as the left foot is landing.

• Let the ball bounce and then catch it with right palm facing up.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push left leg back to the starting position.

• Repeat the exercise 3-5 times.

Left leg

Right hand facing down

• Starting posture.

• Keep ball in the right hand.

• Lunge forward with left leg and right arm.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward to the ground with right hand, palm facing down, aiming at a spot on the right of the body as far forward as the left foot is landing.

• Let the ball bounce and then catch it with right palm facing down.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

MORE

Lunge with Straight Bounce Left Leg

• Push left leg back to the starting position.

• Repeat the exercise 3-5 times.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• Keep the eyes open to avoid dizziness.

• Make sure to control direction and power of the toss.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Be aware of all sensations coming from different parts of the body working together to allow balance acquisition and maintenance (foot, knee, leg, glutes, abdominal wall muscles).

• Once the foot lands, make sure the knee stays on top of the heel and does not reach nor overpass the toes (lower leg should be perpendicular to the ground).

• Make sure the arm swings outside the body frame.

• Lunging leg: make sure the knee is lined up with the hip and the foot.

• Back leg: makes sure the hip, knee and foot are lined up, facing forward.

• Weight is on the ball of the foot.

• Make sure the arm swings outside the body frame.

Lunge with Straight Bounce Right Leg

Execution

Right leg

Right hand facing up

• Starting posture.

• Keep ball in the right hand.

• Lunge forward with right leg and right arm.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward to the ground with right hand, palm facing up, aiming at the place outside of where the right foot is landing.

• Let the ball bounce and then catch it with right palm facing up.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

Right leg

Right hand facing down

• Starting posture.

• Keep ball in the right hand.

• Lunge forward with right leg and right arm.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward to the ground with right hand, palm facing down, aiming at a place outside of where the right foot is landing.

• Let the ball bounce and then catch it with right palm facing down.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

Right leg

Left hand facing up

• Starting posture.

• Keep ball in the left hand.

• Lunge forward with right leg and left arm.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward to the ground with left hand, palm facing up, aiming at a spot on the left of the body as far forward as the right foot is landing.

• Let the ball bounce and then catch it with left palm facing up.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

Right leg

Left hand facing down

• Starting posture.

• Keep ball in the left hand.

• Lunge forward with right leg and left arm.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward to the ground with left hand, palm facing down, aiming at a spot on the left of the body as far forward as the right foot is landing.

• Let the ball bounce and then catch it with left palm facing down.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

MORE

Lunge with Straight Bounce Right Leg

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

Key points

Do not rush.

Make sure to follow the breathing pattern.

• Keep the eyes open to avoid dizziness.

• Make sure to control direction and power of the toss.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Be aware of all sensations coming from different part of the body working together to allow balance acquisition and maintenance (foot, knee, leg, glutes, abdominal wall muscles).

• Once the foot lands, make sure the knee stays on top of the heel and does not reach nor overpass the toes (lower leg should be perpendicular to the ground).

• Make sure the arm swings outside the body frame.

• Lunging leg: make sure the knee is lined up with the hip and the foot.

• Back leg: makes sure the hip, knee and foot are lined up, facing forward.

• Weight is on the ball of the foot.

• Make sure the arm swings outside the body frame.

• Let the ball bounce and then catch it with right palm facing up.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push left leg back to the starting position.

• Repeat the exercise 3-5 times.

Left leg

Right hand facing down

• Starting posture.

• Keep ball in the right hand.

• Lunge forward with left leg and right arm.

• Keep arm on the side, outside the body's frame.

• Knee and elbow move at the same time.

• At the same time the lunge is happening, toss the ball forward to the ground with right hand, palm facing down, aiming at a spot on the right of the body as far forward as the left foot is landing.

• Let the ball bounce and then catch it with right palm facing down.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push left leg back to the starting position.

• Repeat the exercise 3-5 times.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• Keep the eyes open to avoid dizziness.

• Make sure to control direction and power of the toss.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Be aware of all sensations coming from different part of the body working together to allow balance acquisition and maintenance (foot, knee, leg, glutes, abdominal wall muscles).

• Once the foot lands, make sure the knee stays on top of the heel and does not reach nor overpass the toes (lower leg should be perpendicular to the ground).

• Make sure the arm swings outside the body frame.

• Lunging leg: make sure the knee is lined up with the hip and the foot.

• Back leg: makes sure the hip, knee and foot are lined up, facing forward. Weight is on the ball of the foot.

• Make sure the arm swings outside the body frame.

Lunge with Cross Bounce Left Leg

Execution

Left leg, midline bounce

• Starting posture.

• Keep ball in the right hand.

• Lunge forward with left leg.

• At the same time the lunge is happening, toss the ball forward to the ground with the right hand, palm facing up, aiming at a spot in the midline of the body as far forward as the left foot is landing.

• Let the ball bounce and then catch it with the left hand, palm facing down.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push left leg back to the starting position.

• Repeat the exercise 3-5 times.

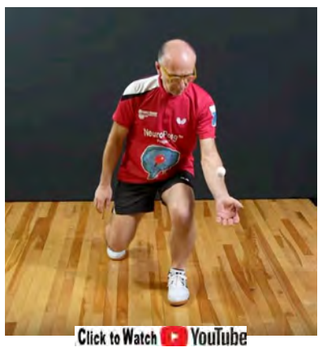
Left leg, outside bounce

• Starting posture.

• Keep ball in the right hand.

• Lunge forward with left leg.

• At the same time the lunge is happening, toss the ball forward to the ground with the right hand, palm facing up, arm crossing in front of the body, aiming at a spot outside of where the left foot is landing.



• Let the ball bounce and then catch it with the left hand, palm facing down.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• Make sure to control the direction and power of the toss.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Be aware of all sensations coming from different part of the body working together to allow balance acquisition and maintenance (foot, knee, leg, glutes, abdominal wall muscles).

• Once the foot lands, make sure the knee stays on top of the heel and does not reach nor overpass the toes (lower leg should be perpendicular to the ground).

• Make sure the arm swings outside the body frame.

• Lunging leg: make sure the knee is lined up with the hip and the foot.

• Back leg: makes sure the hip, knee and foot are lined up, facing forward. Weight is on the ball of the foot.

• The time a leg stays off the floor relies on the sensations coming from the standing leg and its different parts providing confidence and balance.

• If needed, variation two may be performed for better balance control.

Lunge with Cross Bounce Right Leg

Execution

Right leg, midline bounce

• Starting posture.

• Keep ball in the left hand.

• Lunge forward with right leg.

• At the same time the lunge is happening, toss the ball forward to the ground with the left hand, palm facing up, aiming at a spot in the midline of the body as far forward as the right foot is landing.

• Let the ball bounce and then catch it with the right hand, palm facing down.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

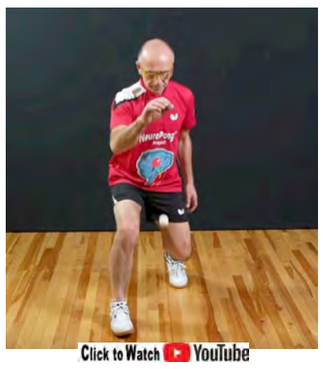
Right leg, outside bounce

• Starting posture.

• Keep ball in the left hand.

• Lunge forward with right leg.

• At the same time the lunge is happening, toss the ball forward



to the ground with the left hand, palm facing up, arm crossing in front of the body, aiming at a spot outside of where the right foot is landing.

• Let the ball bounce and then catch it with the right hand, palm facing down.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• Keep the eyes open to avoid dizziness.

• Make sure to control direction and power of the toss.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Be aware of all sensations coming from different part of the body working together to allow balance acquisition and maintenance (foot, knee, leg, glutes, abdominal wall muscles).

• Once the foot lands, make sure the knee stays on top of the heel and does not reach nor overpass the toes (lower leg should be perpendicular to the ground).

• Make sure the arm swings outside the body frame.

• Lunging leg: make sure the knee is lined up with the hip and the foot.

• Back leg: makes sure the hip, knee and foot are lined up, facing forward. Weight is on the ball of the foot.

• Make sure the arm swings outside the body frame.

Hit Ball with Foot

Execution

Spin the ball

• Starting posture.

• Keep ball on one hand (either one).

• Toss ball with extended arm, palm facing up, 2 feet in front of your right foot.

• Let the ball bounce three times on the ground.

• Make the second bounce coincide with a small step forward with the left leg.

• After the third bounce, extend the right leg forward.

• At the top of the third bounce, touch the ball with the ball of the foot and move your leg, still extended, backward.

• This will produce another bounce with a back spin on the ball, which will come back toward you.

• Catch the ball with your hand (either one).

• Repeat the exercise 3-5 times with the right leg.

• The same exercise is repeated 3-5 times with the left leg.

Drive the ball

• Starting posture.

• Keep ball on one hand (either one).

• Drop ball with palm facing up, one foot in front of your right foot.

• Let the ball bounce three times on the ground.

• Do not move from your standing position.

• After the third bounce, flex the right leg up to 90 degrees.

• At the top of the third bounce, touch the ball with the plant of the foot, extending the leg down.

• This will produce another straight bounce.

• Catch the ball with your hand (either one).

• Repeat the exercise 3-5 times with the right leg.

• The same exercise is repeated 3-5 times with the left leg.

Alternate foot

The ball can be kept bouncing every two bounces on the ground, alternating right and left foot.

In doing this, though, a small step backward should be performed before each touch of the ball to allow full extension of the leg.

Key points

• Do not rush.

• Make sure the toss of the ball is not too strong. At the beginning, the first bounce should not be higher than 1 foot.

• The step forward with the left foot has a lot of importance to provide the necessary balance and confidence to move the right leg forward and touch the ball correctly.

• No need to step forward in the variation since the ball will bounce straight up and down in front of the body.

Egg in the Skillet

Click to see Variations

Execution

Dominant hand

• Starting posture.

• Arms relaxed along the side of the body.

• Hold paddle in your dominant hand with a forehand grip.

• Flex dominant forearm to 90 degrees.

• Using the non-dominant hand, place ball in the center of the paddle. Keep it in that position.

• Then, control the rolling of the ball on the surface of the paddle and position it at different locations at the edges of the paddle.

• Keep it in that specific location until instructed to move it.

• Move the ball at 9:00, then at 12:00, then at 3:00 and finally bring it to the center of the paddle again.

• Now, hold paddle in your dominant hand with a backhand grip.

• Flex dominant forearm to 90 degrees.

• Using the non-dominant hand, place ball in the center of the paddle. Keep it in that position.

• Then, control the rolling of the ball on the surface of the paddle and position it at different locations at the edges of the paddle.

• Keep it in that specific location until instructed to move it.

• Move the ball at 9:00, then at 12:00, then at 3:00 and finally bring it to the center of the paddle again.

Key points

• Do not rush.

• Breathe freely.

Variation

• If needed, a basket can be created with the non-dominant hand to keep the ball from falling from the surface of the paddle.

• The size of the basket can be increased or decreased at individual discretion.

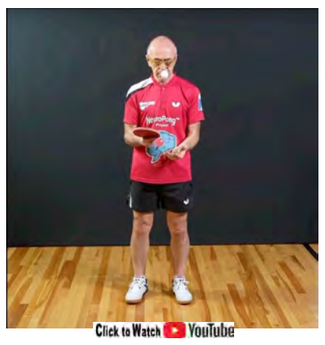
• Repeat the exercise holding the paddle with the non-dominant hand.

• Use both forehand and backhand grip.

• Create a basket with the dominant hand if needed.

Toss, Touch Catch

Click to see Variations



Execution

Movement without ball

• Starting posture.

• Flex both forearms at 90 degrees, with elbow resting at the sides of the torso.

• Hold paddle in your dominant hand and a ball in your non-dominant hand, palm facing up.

• Move both hands inward, converging toward the body's midline.

• Flex and extend elbows alternatively in this position, paying attention to not overlap the hands.

• With elbow still flexed 90 degrees, move both forearms straight in front of the body.

• Flex and extend elbows alternatively in this position.

• With elbows still flexed 90 degrees, move both forearms outward, diverging from each respective part of body.

• Flex and extend elbows alternatively in this position.

Ball in motion

• Now, keeping them flexed, converge the forearms again.

• Toss the ball up with the non-dominant hand on a straight trajectory, touch it with the paddle (in its center) producing a straight trajectory and catch it with the non-dominant hand.

• Repeat the exercise 3-5 times.

• With elbows still flexed 90 degrees, move both forearms straight in front of the body, (i.e., forearms parallel to each other).

• Toss the ball up with the non-dominant hand toward the other hand holding the paddle, this time making a curve trajectory.

• Touch the ball with the paddle (in its center) and send it back to the tossing hand. Make sure the touch will produce a curve trajectory so the non-dominant hand with catch the ball again.

• Repeat the exercise 3-5 times.

• With elbows still flexed 90 degrees, diverge both forearms outward.

• Under toss the ball with the left hand toward the right side, with the arm crossing in front of the body.

• While doing this, rotate the pelvis toward the right and transfer the body weight from the left to the right leg.

• The left leg is now bent, pivoting on the ball of the foot.

• Touch the ball with the paddle (in its center) and send it back to the tossing hand. Make sure the touch will produce a curved trajectory, so the non-dominant hand can catch the ball again.

• Repeat the exercise 3-5 times, making sure the toss and the touch of the ball follow a curve trajectory from one side of the body to the other.

• Perform the same exercise holding the paddle in the non-dominant hand.

Key points

• Do not rush.

• Make sure to control direction (straight, curve, side to side) and power of the toss.

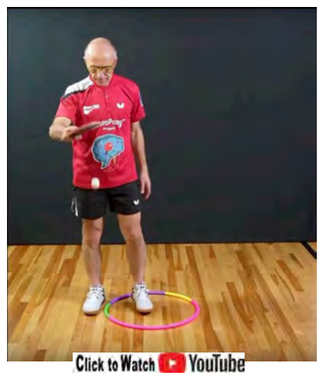
• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Make sure to initiate the pelvis rotation at the time of the toss during the diverging variation.

• Make sure to transfer body weight during the diverging variation.

• Make sure the catch of the ball is far enough from the body to stimulate an appropriate weight transfer on the same side of the catch during the diverging variation.

Playing with Hoop



Execution

Feet Outside

• Starting posture.

• Hold paddle in your dominant hand with a forehand grip and ball in your non-dominant hand, palm facing up.

• Hula hoop (26 inches diameter) is placed on the floor, in front of the body.

• Toss the ball up, on the body's midline, and hit with the paddle into the area of the hoop.

• Keep it hitting the ball, paying attention to hit it at the top of its bounce and always back within the area of the hoop.

• Repeat the exercise several times.

• Continue to hit the ball while moving up and down with the legs.

• Hit it at the top of its bounce into the area of the hoop.

One foot inside

• Now, stand in the area of the floor within the hoop with one foot.

• Toss the ball up and hit it down to the ground with the paddle.

• Hit the ball sending it just outside the perimeter of the hoop.

• Rotate right with your entire body, keep hitting the ball.

• Rotate left with your entire body, keep hitting the ball.

• Repeat the exercise several times.

Two feet inside

• Now, stand in the area of the floor within the hoop.

• Toss the ball up and hit it down to the ground with the paddle.

• Hit the ball sending it just outside the perimeter of the hoop.

• Rotate right with your entire body, keep hitting the ball.

• Rotate left with your entire body, keep hitting the ball.

• The diameter of the hula hoop also can be reduced.

• Repeat all exercises with the paddle in the non-dominant hand.

Key points

• Do not rush.

• Make sure to control direction and power of the toss.

• Make sure to control direction and power of the hit.

• Make sure to hit the ball within the area delimited by the hoop.

• Make sure to feel safe while standing within the hoop and rotating the body.

• Make sure to hit the ball at the top of its bounce.

Lunge with Toss, Bounce, Hit, Catch, Left Leg

Execution

Left leg, midline bounce

- Starting posture.
- Keep paddle in the right hand, forehand grip.
- Keep ball in the left hand.
- Breathe in while standing and breathe out during the entire lunge.
- Lunge forward with left leg.
- At the same time the lunge is happening, toss the ball forward to the ground with the left hand, palm facing up, aiming at a spot in the midline of the body as far forward as the left foot is landing.
- Let the ball bounce and then hit it to the ground again with the paddle (forehand face of it).
- Right arm swings back, on the side of the body.
- Let the ball bounce again and catch it with the left hand, palm facing down.
- Once in the lunge position, make sure the abdominal wall muscles are engaged.
- Push right leg back to the starting position.
- Repeat the exercise 3-5 times.

Left leg, outside bounce

- Starting posture.
- Keep paddle in the right hand, forehand grip.
- Keep ball in the left hand.
- Breathe in while standing and breathe out during the entire lunge.
- Lunge forward with right leg.
- At the same time the lunge is happening, toss the ball forward to the ground with the left hand, palm facing up, aiming at a spot outside of where the left foot is landing.
- Let the ball bounce and then hit it to the ground again with the paddle (forehand face of it).
- Right arm swings back, on the side of the body.
- Let the ball bounce again and catch it with the left hand, palm facing down.
- Catch happens with left arm on the left side of the body.
- Once in the lunge position, make sure the abdominal wall muscles are engaged.
- Push right leg back to the starting position.
- Repeat the exercise 3-5 times.
- Repeat both versions lunging with the right leg, tossing with the right hand, hitting with the paddle in left hand and catching with right hand.

Key points

- Do not rush.
- Follow the breathing pattern.
- Be sure to control direction and power of the toss.
- Be sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.
- Be aware of all sensations coming from different parts of the body working together to allow balance acquisition and maintenance (foot, knee, leg, glutes, abdominal wall muscles).
- Once the foot lands, make sure the knee stays on top of the heel and does not reach or overpass the toes (lower leg should be perpendicular to the ground).
- Make sure the arm swings outside the body frame.
- Lunging leg: make sure the knee is lined up with the hip and the foot.
- Back leg: makes sure the hip, knee and foot are lined up, facing forward. Weight is on the ball of the foot.

Lunge with Toss, Bounce, Hit, Catch, Right Leg

Execution

Right leg, midline bounce

• Starting posture.

• Keep paddle in the right hand, forehand grip.

• Keep ball in the left hand.

• Breathe in while standing and breathe out during the entire lunge.

• Lunge forward with right leg.

• At the same time the lunge is happening, toss the ball forward to the ground with the left hand, palm facing up, aiming at a spot in the midline of the body as far forward as the right foot is landing.

• Let the ball bounce and then hit it to the ground again with the paddle (forehand face of it).

• Right arm swings back, on the side of the body.

• Let the ball bounce again and catch it with the left hand, palm facing down.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

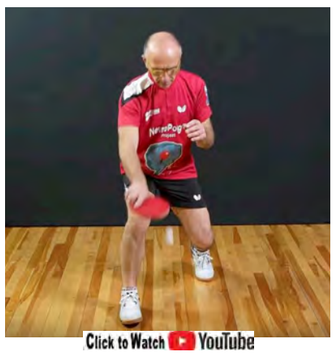
• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

Right leg, outside bounce

• Starting posture.

• Keep paddle in the right hand, forehand grip.



• Keep ball in the left hand.

• Breathe in while standing and breathe out during the entire lunge.

• Lunge forward with right leg.

• At the same time the lunge is happening, toss the ball forward to the ground with the left hand, palm facing up, arm crossing in front of the body, aiming at a spot outside of where the right foot is landing.

• Let the ball bounce and then hit it to the ground again with the paddle (forehand face of it).

• Right arm swings back, on the side of the body.

• Let the ball bounce again and catch it with the left hand, palm facing down.

• Catch happens with left arm still crossing in front of the body.

• Once in the lunge position, make sure the abdominal wall muscles are engaged.

• Push right leg back to the starting position.

• Repeat the exercise 3-5 times.

• Repeat both versions lunging with the left leg, tossing with the right hand, hitting with the paddle in left hand and catching with right hand.

Key points

• Do not rush.

• Make sure to follow the breathing pattern.

• Make sure to control direction and power of the toss.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Be aware of all sensations coming from different part of the body working together to allow balance acquisition and maintenance (foot, knee, leg, glutes, abdominal wall muscles).

• Once the foot lands, make sure the knee stays on top of the heel and does not reach nor overpass the toes (lower leg should be perpendicular to the ground).

• Make sure the arm swings outside the body frame.

• Lunging leg: make sure the knee is lined up with the hip and the foot.

• Back leg: makes sure the hip, knee and foot are lined up, facing forward. Weight is on the ball of the foot.

Hand Scissors

Click to see Variations

Execution

Palm down

• Starting posture.

• The two partners are facing each other.

• Flex the dominant forearms and keep them in the neutral position.

• The first partner (red shirt here) will place the ball in the gap between the index and middle finger of the flexed forearm, at the level of the tips of the fingers, like if holding it at the tip of a scissor.

• He will then rotate the hand so its palm is facing down.

• The second partner (blue shirt here) will grab the ball with his hand, palm still in neutral position, between the index and middle finger. Then, he will rotate the forearm so the palm is facing down.

• The first partner will then rotate the forearm in the neutral position and will grab the ball between the middle and ring finger. Then he will rotate the forearm so the palm is facing down.

• The second partner will grab the ball, palm in neutral position, between the middle and ring finger. Then, he will rotate the forearm so the palm is facing down.

• The first partner will then rotate the forearm in the neutral position and will grab the ball between the ring and the pinky finger. Then he will rotate the forearm so the palm is facing down.

• The second partner will grab the ball, palm in neutral position, between the ring and the pinky finger. Then, he will rotate the forearm so the palm is facing down

• The ball will then be moved back to the gap between the index and middle finger of the second partner, going from one gap of the adjacent fingers of one partner to the same gap of the other partner, rotating hands in the same fashion: the feeding hand is presenting the ball palm facing down and the receiving hand is grabbing it with the palm in neutral position.

Palm up

• Starting posture.

• The two partners are facing each other.

• Flex the dominant forearms and keep them in the neutral position.

• The first partner (red shirt here) will place the ball in the gap between the index and middle finger of the flexed forearm, at the level of the tips of the fingers, like if holding it at the tip of a scissor.

• He will then rotate the hand so its palm is facing up.

• The second partner (blue shirt here) will grab the ball with his hand, palm still in neutral position, between the index and middle finger. Then, he will rotate the forearm so the palm is facing up.

• The first partner will then rotate the forearm in the neutral position and will grab the ball between the middle and ring finger. Then he will rotate the forearm so the palm is facing up.

• The second partner will grab the ball, palm in neutral position, between the middle and ring finger. Then, he will rotate the forearm so the palm is facing up.

• The first partner will then rotate the forearm in the neutral position and will grab the ball between the ring and the pinky finger. Then he will rotate the forearm so the palm is facing up.

• The second partner will grab the ball, palm in neutral position, between the ring and the pinky finger. Then, that partner will ro-

MORE

Hand Scissors

tate the forearm so the palm is facing up.

• The ball will then moved back to the gap between the index and middle finger of the second partner, going from one gap of the adjacent fingers of one partner to the same gap of the other partner, rotating hands in the same fashion: the feeding hand is presenting the ball palm facing up and the receiving hand is grabbing it with the palm in neutral position.

Key points

• Do not rush.

• Make sure the ball is grabbed by the fingertips.

• Make sure to feel the pressure of the fingers grabbing the ball before releasing the pressure of the fingers holding the ball.

• Make sure the feeding hand is presenting the ball to the other hand with its palm facing down or facing up.

• The grabbing hand does so with its palm in neutral position.

Tossing

Click to see Variations

Execution

• Starting posture.

• The two partners are facing each other and will bend their forearms: the first partner (red shirt here) will bend his right forearm and the second partner (blue shirt here) will bend his left forearm.

• The first partner will start tossing the ball with his right hand, palm facing up, and the second partner will catch it with his left hand, palm facing up as well.

• Repeat this a few times.

• Then, the catching hand of either partners will catch the ball with palm facing down.

• Repeat this a few times.

• Now, each partner will relax both forearms and will flex the contralateral: left forearm for the first partner and right forearm for the second partner.

Repeat the tossing of the ball as described above, first with the catching hand palm facing up then with palm facing down.

• Repeat this a few times.

• Now, the partners will use the contralateral hand: the first partner will toss the ball using the left hand and the second partner will catch it with his left hand.

• The ball is caught with palm either facing up or facing down.

• Finish this exercise with the first partner tossing the ball using the right hand and the second partner catching it with his left hand.

• Increase the distance between the partners and the height of the toss per individual capacity.

Key points

• Do not rush.

• Make sure to control direction and power of the toss.

• At the beginning, toss can be only a few inches.

• When palm is facing up, make sure the catching hand will not reach for the ball, waiting instead for it to come down to the palm.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Make sure to have a visualization of the ball in the receiving hand.

Toss, Squat

Execution

• Starting posture.

• The two partners are facing each other and one will start tossing the ball in the air with palm facing up. The toss will be directed to the partner's ipsilateral or contralateral hand, at the tossing partner's discretion.

• The catching partner will do so with his palm either facing up or down, at his own discretion.

• While doing so, both partners squat and return.

• Repeat this exercise a few times.

Key points

• Do not rush.

• Make sure to control direction and power of the toss.

• At the beginning, toss can be only few inches.

• When palm is facing up, make sure the catching hand will not reach for the ball, waiting instead for it to come down to the palm.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without fingers overlapping.

• Make sure to have a visualization of the ball in the receiving hand.

• Make sure to be in synch with your partner while squatting and return.

Toss, Bounce

Execution

• Starting posture.

• The two partners are facing each other and one will start tossing the ball to each other, letting it bounce first on the ground.

• Both the toss and the catch will be performed with palms facing down.

• The spot of the bounce on the ground is equidistant between the two partners.

• The tossing and catching hand could be either to the same side or to the opposite side.

• The distance between the two partners can be increased at their own discretion.

• The spot on the ground

where the ball is tossed can be changed from equidistant, to close, or faraway from each partner.

• While doing so, both partners can also go up and down with their legs.

• Repeat this exercise a few times.

Key points

• Do not rush.

• Make sure to control the direction and power of the toss.

• Make sure to identify the spot on the ground where the bounce of the ball will happen. This will facilitate the catch of the other partner.

• Make sure that the fingertips of the catching hand can touch and feel the surface of the ball, without the fingers overlapping.

• Make sure to be in in synch with your partner while squatting and returning.

Volleying

Execution

• Starting posture.

• The two partners are facing each other.

• They will pass the ball in the air to each other hitting it with their paddle.

• They can alternate forehand and backhand at their pleasure and discretion.

• While doing this, they may go up and down with their legs.

• Repeat this exercise a few times.

Key points

• Do not rush.

• Make sure to control direction and power of the hit.

• Make sure the face of the paddle is well oriented to facilitate the direction of the ball.

• Make sure to be in synch with your partner while squatting and returning.

Egg in the Skillet

Click to see Variations

Execution

• Starting posture.

• The two partners are facing each other.

• Arms relaxed along the side of the body.

• Both partners hold the paddle on their dominant hand with a forehand grip and will flex the forearms to 90 degrees.

• Using the non-dominant hand, the first partner (red shirt here) will place ball in the center of the paddle.

• He will keep the ball in that position and then will control the rolling of the ball on the entire surface of the paddle.

• Then, he will let the ball roll onto the paddle of the second partner (blue shirt here).

• The second partner will then control the rolling of the ball on the surface of his paddle and will pass it again to the first partner.

• The two partners will continue to pass the ball on each other's paddle, feeling free also to bounce it few times on his own paddle before passing it.

• Furthermore, while passing the ball, the two partners con also go up and down on their legs.

• Repeat this exercise a few times.

• This exercise may involve more than two partners at once as well.

Key points

• Do not rush.

• Make sure to control the ball on the paddle before passing it.

• Make sure the receiving paddle is under the passing paddle.

• Make sure the face of the paddle is well oriented to facilitate the direction of the ball.

• Make sure to be in synchrony with your partner while going up and down on the legs.

Toss, Touch, Catch

Execution

• Starting posture.

• The two partners face each other.

• Both partners hold the paddle on their dominant hand with a forehand grip and will flex the forearms to 90 degrees.

• Using the non-dominant hand, the first partner (red shirt here) will toss the ball with palm facing up.

• He will then touch the ball with the paddle (in its center) and send it toward the catching hand (palm facing down) of the second partner (blue short here).

• The second partner will do the same thing.

• Repeat this exercise a few times.

• The touch of the ball on the paddle can also be made with a backhand grip.

• Repeat this exercise a few times.

• The ball can be passed by hitting it to the ground, in a spot in between the two partners.

• Repeat this exercise a few times.

Key points

• Do not rush.

• Make sure to control the direction and the power of the touch of the ball with the paddle.

• Make sure the face of the paddle is well oriented to facilitate the direction of the ball.

Toss, Hit, Catch

Click to see Variations

Execution

• Starting posture.

• The two partners are facing each other.

• Both partners hold the paddle on their dominant hand with a forehand grip and will flex the forearms to 90 degrees.

• Using the non-dominant hand, the first partner (red shirt here) will toss the ball with palm facing up.

• He will then hit the ball with the paddle (in its center) into the ground, in a spot equidistant between the two partners.

• After catching the ball, the second partner will do the same thing.

• Repeat this exercise a few times.

• The hit of the ball on the paddle can also be made with a backhand grip.

• Repeat this exercise a few times.

Key points

• Do not rush.

• Make sure to control the direction and the power of the touch of the ball with the paddle.

• Make sure the face of the paddle is well oriented to facilitate the direction of the ball.

• Make sure to control the hit of the ball on the ground in a equidistant spot between the two partners.

Bounce Ball on Table

Click to see Variations

Execution

• Starting posture.

• The receiving partner stays at the baseline of the table.

• The tossing partner will toss the ball from the opposite site of the table, making sure to produce a first bounce on his part of the table.

• Once the ball will touch the surface of the receiving partner side of the table, he will pronounce the word “bounce.”

• Repeat this exercise until the identification of the bounce on the surface of the table is well established.

Key points

• Do not rush.

• For the receiving partner: make sure his/her eyes are tracking the trajectory of the incoming ball to subsequently identify its bounce on his/her part of the table.

• This is of extreme importance to follow the trajectory the ball will have after the bounce.

• It will be at the top of this bounce that the ball will be then contacted with the paddle (see the Hittitng Ball exercise, next page).

Hitting Ball

Click to see Variations

Execution

• Starting posture.

• The receiving partner stays at the baseline of the table.

• The tossing partner will toss the ball from the opposite site of the table, making sure to produce a first bounce on his part of the table.

• Once the ball will touch the surface of the receiving partner side of the table, he will say the word “bounce.”

• After the bounce, the receiver will identify the top of the bounce and hit the ball with the paddle.

• While hitting the ball the receiver will say the word “hit.”

• Repeat this exercise until the identification of the bounce and its top are well established. The top of the bonce is the moment when to hit the ball.

Key points

• Do not rush.

• Receiving partner: make sure his/her eyes are tracking the trajectory of the incoming ball to subsequently identify its bounce on his/her part of the table.

• It is of extreme importance to follow the trajectory of the ball after the bounce.

Basic Strokes

Click to see Variations

Execution

Backhand stroke production (top spin)

• Starting posture.

• Hold the paddle on the dominant hand.

• From the starting position, if one attempts to swing the arms from side to side, he is unable because the arms will hit the torso.

• Now, bend the knees and hips, with weight on the ball of the feet. This position will move the arms forward of the trunk and free to swing side to side.

• Specifically, the elbows will lay on a plane anterior to the torso (see both side and frontal view).

• While keeping the elbow of the dominant arm in this position, move the forearm toward the belly button.

• From this position move the forearm forward and upward.

• Do not move your wrist but just the forearm.

Transition from backhand to forehand (top spin)

• Keep the elbow in the same position at the end of the backhand stroke.

• Rotate the pelvis toward the right and transfer the body weight from the left to the right leg.

• The left leg is pivoting on the ball of the foot.

• This rotation will allow the passive positioning of the forearm from the front (end of backhand stroke) to the right side.

• While rotating with the pelvis, rotate also the face of the paddle, transitioning from the backhand to the forehand.

• The right forearm stays flexed 90 degrees.

• Rotate the pelvis back to the front, switching back the body weight from the right to the left leg.

• This rotation will move the paddle forward: the paddle will contact the ball in front, 45 degrees into the rotation and will end the stroke at the midline at the height of the nose.

• During the entire execution, keep the paddle with a 45 degrees angle.

• In these videos the face of the paddle has an angle of 45 degrees tilted down, allowing the production of a top spin shot.

Key points

• Do not rush.

• Keeping the hips and knee bent is of paramount importance to keep the body weight forward and to the elbow under constant vision.

• The elbow should lay on a plane anterior to the torso

• The elbow is the pivot point during the execution of the backhand stroke.

• It is good to note that during the preparation of the forehand, the paddle will arrive to the side by rotating the pelvis and not by opening the shoulder joint.

Moving Forward on Table

Execution

Long toss

• Starting posture.

• Table is folded at the center.

• Stay at the baseline of the table.

• Flex right forearm, with elbow resting at the side of the torso.

• Ball is in the right palm.

• Palm is facing forward and downward.

• In this standing position, toss the ball aiming at a midpoint between the baseline and the net. This will make the ball bounce on the vertical portion of the table in a way that it will have only one bounce back on the horizontal part of the table before being caught (assuming the player will maintain the same standing position).

• Repeat the same toss few times.

Short toss

• Now, toss the ball producing a bounce close to the net. This will make the ball bounce on the vertical portion of the table in a way that there will two bounces back on the horizontal part of the table before being caught (assuming the player will maintain the same standing position).

Moving forward on the table

• To avoid a second bounce on the horizontal part of the table, the player needs to move forward, close to the oncoming ball.

• The player will accomplish this by bending the knees and hips, with weight on the ball of the feet, and moving his/her dominant leg (right in this clip) under the table.

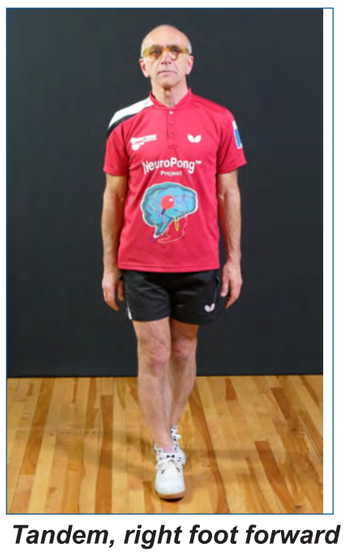
• The player needs to move forward and at the same time both right knee and right (imagine them on the same place, one under and one above the table).

• Hit the ball by the extension of the forearm.

Variations

Feet shoulder width apart

Tandem, left foot forward



Tandem, right foot forward

Standing, feet shoulder width apart

Feet in this position are part of the starting posture proposed at the beginning of each exercise.

- Feet shoulder width apart.
- Knees slightly bent.
- Pelvis neutral, not tilted forward nor backward.
- Engage abdominal muscles by pulling the belly button towards the spine. This sensation can be reinforced by feeling the contraction with the fingers.
- Chest forward.
- Shoulders in line with the pelvis.
- Keep head straight as if being lifted from the crown of the head.
- Eyes at the horizon
- Arms relaxed along the side of the body

Standing, feet in tandem position

One foot is directly in front of the other. Please keep the rest of the starting posture unchanged.

Right foot forward

Left foot forward

Standing, with one foot forward

If the tandem position cannot be maintained, step far enough forward that the heel of the forward foot is ahead of the toes of the other foot. The distance between the feet can vary, from shoulder width to heel-toes touching.

Seating

• Pelvis neutral, not tilted forward nor backward.

• Engage abdominal muscles by pulling the belly button towards the spine. This sensation can be reinforced by feeling the contraction with the fingers.

• Chest forward.

• Shoulders in line with the pelvis (trunk squared with the pelvis).

• Keep head straight as if being lifted from the crown of the head.

• Eyes at the horizon.

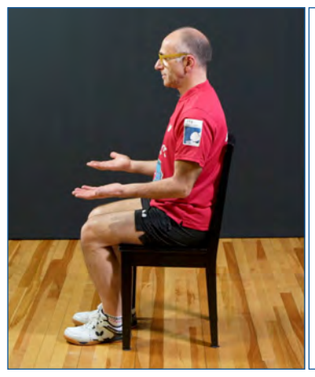
• Arms relaxed along the side of the body:

– Elbows can be flexed 90 degree at the trunk.

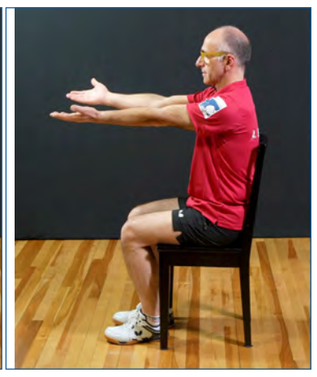
– The entire arm can be raised to the shoulder height.

– Upper legs squared with the lower legs.

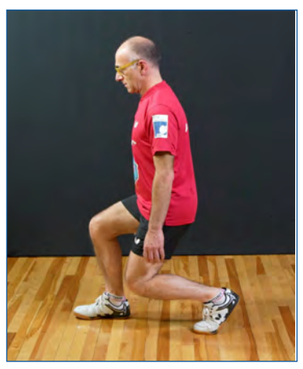
– Feet touching the ground entirely.



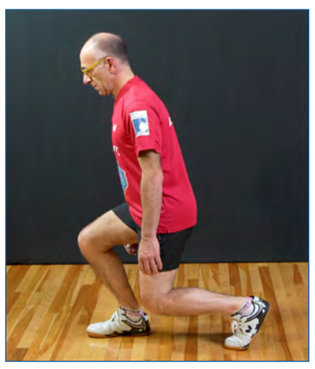
Chair, arms flexed



Chair, arms extended



Keep knee over heel

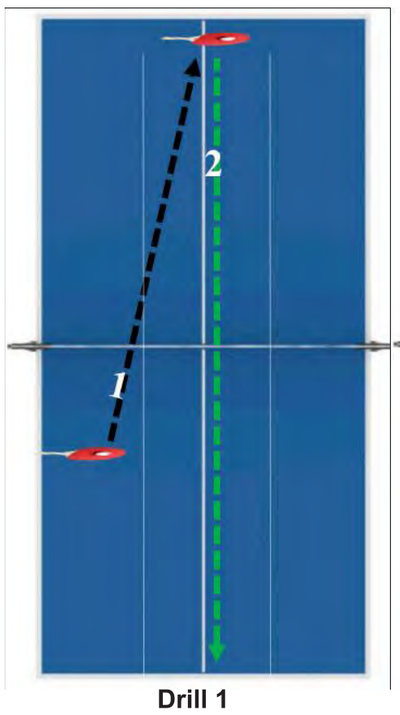


Wrong: knee past heel

Lunge

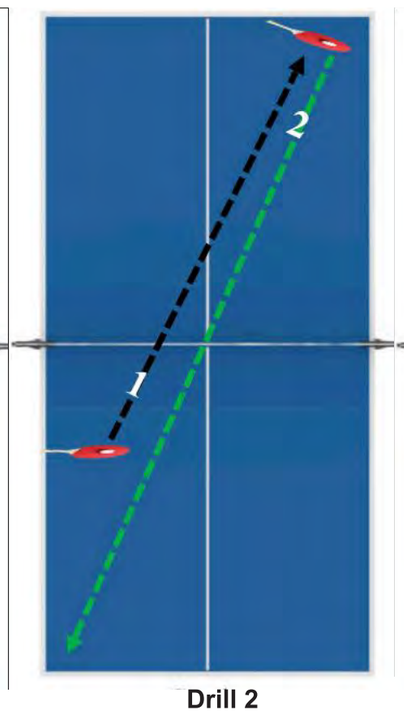
• Move forward with one leg, making sure that the lunging knee stays on top of the heel.

Most of the exercises in this handbook can be modified to accommodate an individual's physical capabilities by using the variations on these pages. These variations also can be added as another layer to each exercise.



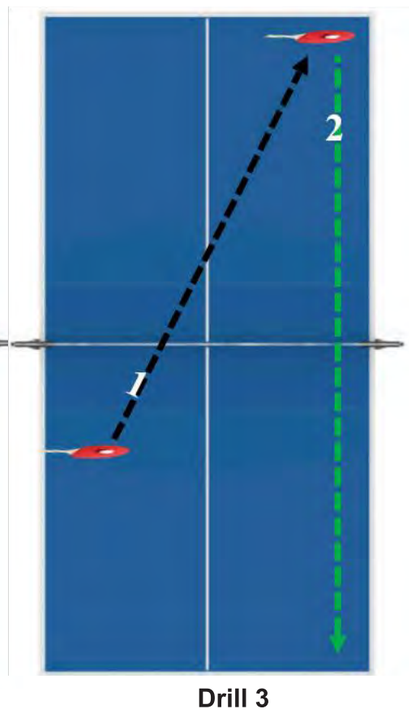
Drill 1

The coach (standing at bottom) feeds balls to the receiver's backhand. The participant is positioned at the center of the table and returns the ball down the midline. Place objects on either side of the midline to define a wider path if needed.



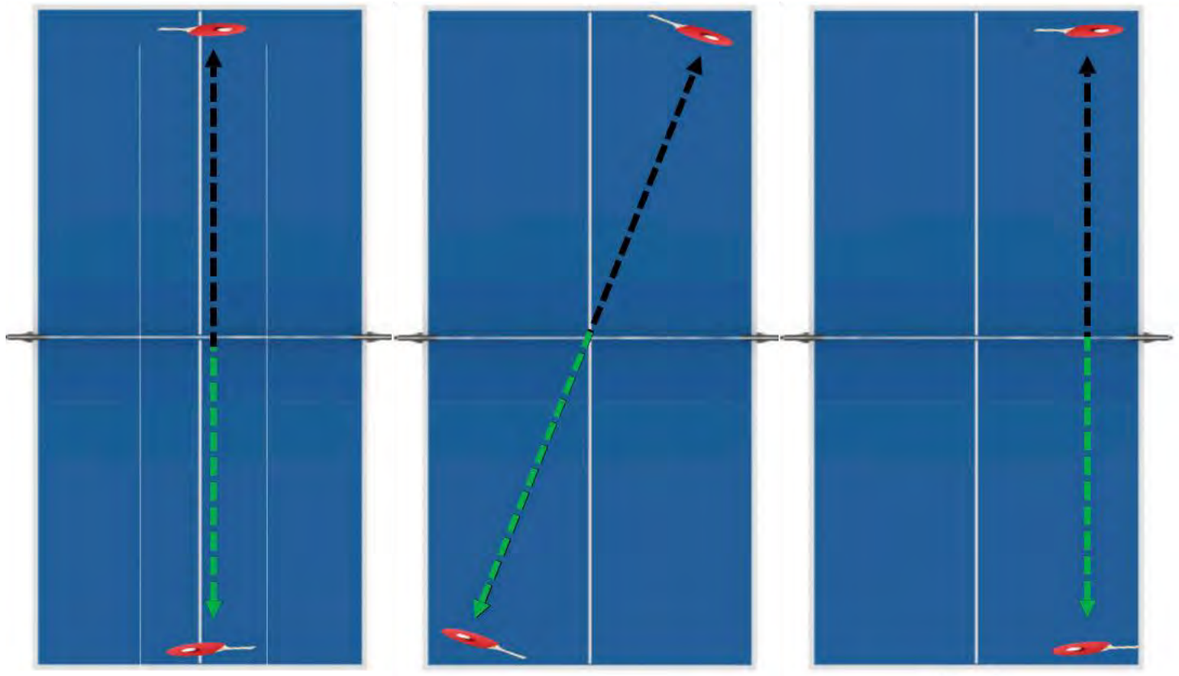
Drill 2

The coach feeds balls to the receiver's backhand. The participant stands at the backhand side of the table and returns the ball cross court.



Drill 3

The coach feeds balls to the receiver's backhand. The participant returns the ball straight down the line.



Drill 4

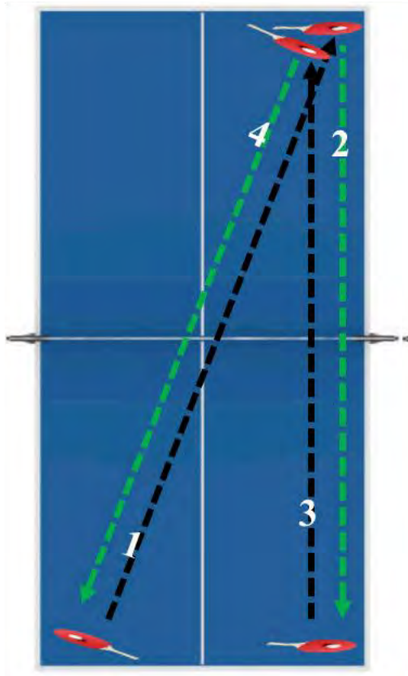
The coach and the receiver hit backhands down the mid-line. Place objects on either side of the midline to define a wider path if needed.

Drill 5

Both players use backhands to rally cross court.

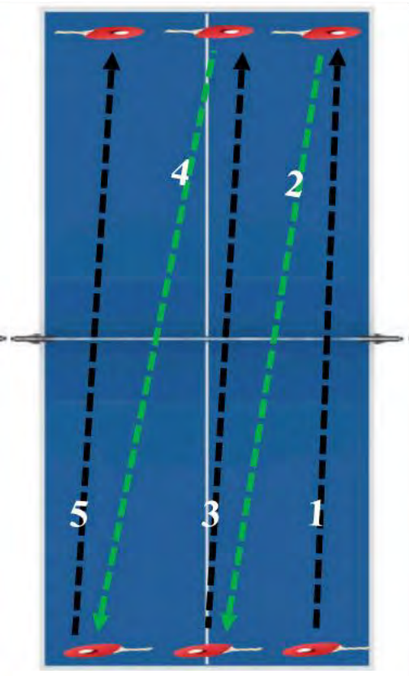
Drill 6

Players use backhands to both hit down the line.



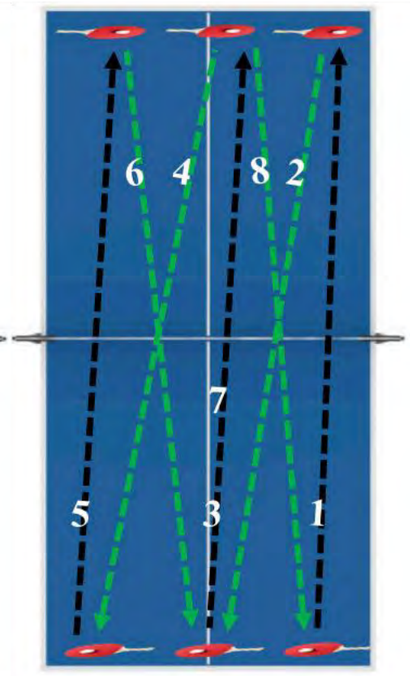
Drill 7

The coach hits a backhand cross court, and the ball is returned down the line. The coach then hits a forehand back down the line. The receiver returns with a backhand cross court.



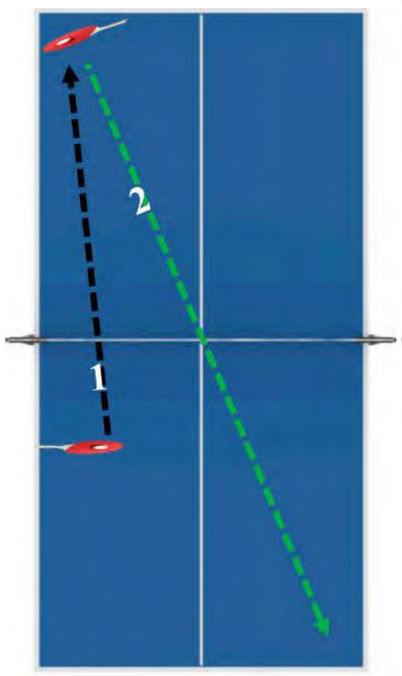
Drill 8

Both coach and participant use backhands for the entire drill. The coach starts at the forehand corner hitting the ball to the backhand side, then progressively moves toward the left side. The participant starts at the backhand side, then moves progressively to the forehand side. Once the table has been covered, repeat from the starting point. The pace and speed should be adjusted for the participant.



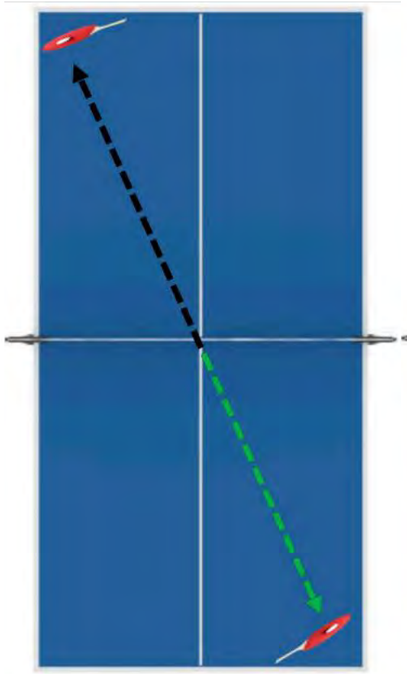
Drill 9

Both coach and participant use backhands for the entire drill. Similar to the previous drill, the coach starts at the forehand corner using a backhand, hitting the ball to the backhand side, then moves progressively toward the left side. The participant starts at the backhandside, then moves progressively to the forehand side. Once the table has been covered, they continue to play but reverse the order continuously.



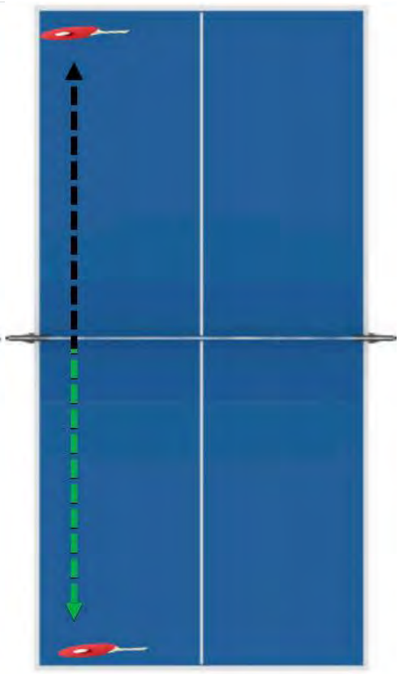
Drill 10

The coach feeds balls to the forehand. The receiver returns them cross court.



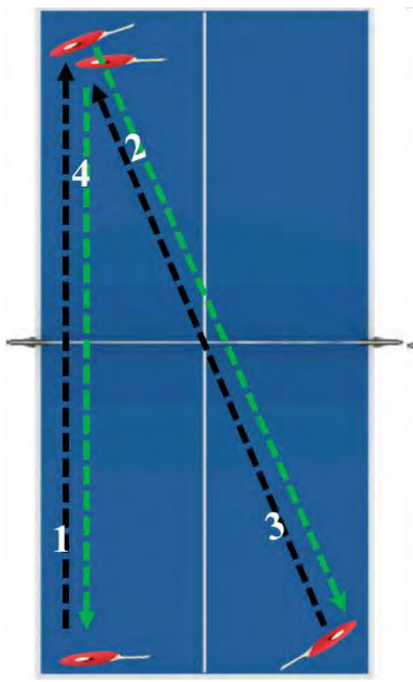
Drill 11

Both rally cross court using forehands.



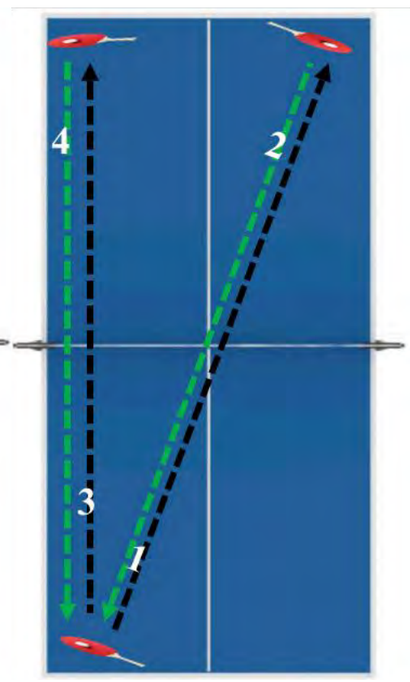
Drill 12

Both use backhand to rally down the line.



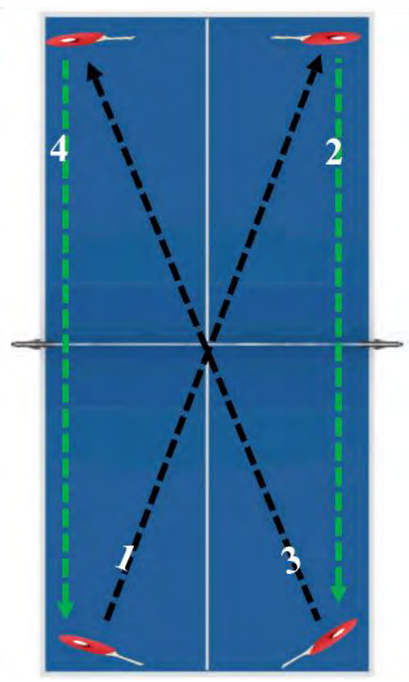
Drill 13

The coach starts a rally using a backhand to hit down the line. The receiver returns with a forehand cross court, the coach returns with a forehand cross court, the participant returns with a backhand down the line, and the rally continues.



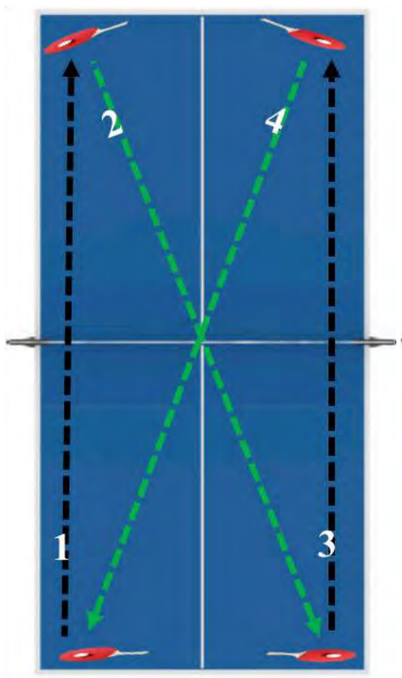
Drill 14

The coach starts a rally using a backhand to hit the ball cross court. The receiver returns with a backhand cross court. The coach returns with a backhand down the line, and the receiver then returns the ball ball down the line, and the rally continues.



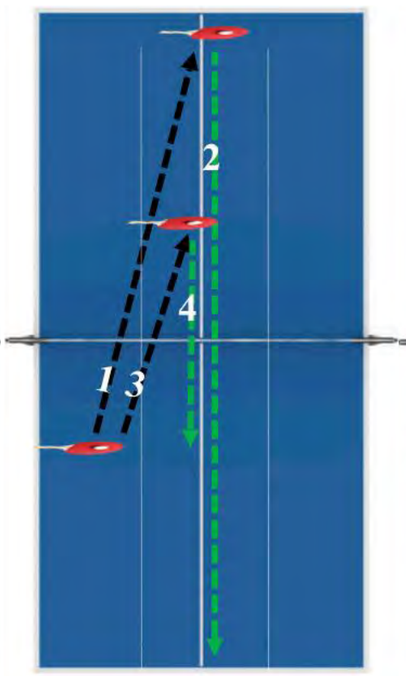
Drill 15

The coach starts a rally using a backhand, sending the ball cross court. The receiver hits a backhand down the line cross court, and the coach uses a forehand to return it cross court. The receiver then hits a backhand down the line, and the rally continues.



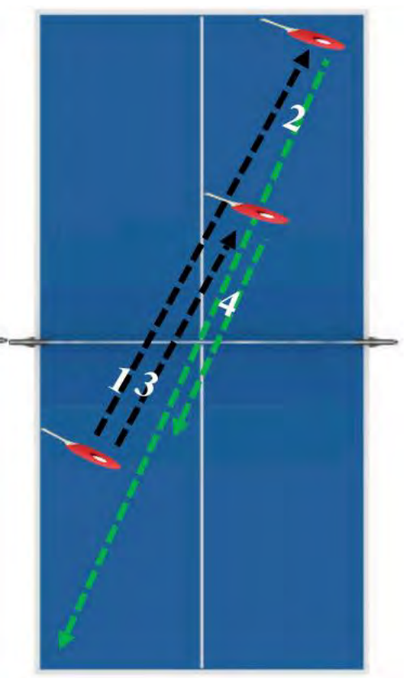
Drill 16

The coach will starts a rally using with a backhand down the line. The receiver hits a backhand cross court. The coach then hits a forehand down the line, and the receiver hits a backhand cross court, and the rally continues.



Drill 17

The coach feeds balls to the backhand, with the receiver positioned at the centerline of the table. The receiver returns the ball along a midline corridor. Objects can be placed along the corrider to help define it if needed. The coach then feeds a short ball with underspin and the participant hits a short backhand underspin.



Drill 18

The coach feeds balls to the receiver's backhand side and the receiver returns a backhand cross court. The coach then feeds a short ball with underspin for the receiver to hit a short cross court backhand underspin return.

NeuroPong™ founder Antonio Barbera, center in red, leads warmup exercises for a group of NeuroPong™ participants prior to the table tennis competition at the Huntsman World Senior Games. The games, which draws participants from some 30 countries and includes most Olympics sports, now has a division for NeuroPong™.

Fun is just one of the program's benefits

The NeuroPong™ program exemplifies an innovative approach to managing neurological conditions by providing a series of exercises and table tennis activity within a fun and motivating environment. The personal accounts of the participants below vividly illustrate how the program not only enhances physical capabilities in a personal way, but also fosters a strong sense of community and emotional well-being.

Their comments also demonstrate how the structured use of table tennis can lead to significant improvements in all their abilities in an holistic way. The following are comments that were volunteered from people who have participated in the NeuroPong™ program:

Helen

Since starting the program, Helen notes that she is now "moving left, moving right, moving back and forth, free from the rigidity and balance challenges that came with my Parkinson's diagnosis 4 ½ years ago." Reflecting on her journey since joining the group two years ago, she recalled her initial struggles: "I did not move in response to the ping pong ball coming my way. I would stand still, sometimes holding on to the table in order to send the ball back over the

net." Helen attributed her improvement to "the retraining of my brain that has been compromised as a result of the death of nerve cells meant to produce dopamine." She emphasized the community aspect of NeuroPong™: "The other piece of NeuroPong™ that is so rewarding is being part of the community that has grown from our twice weekly get-togethers." Helen found profound personal growth: "There, I have discovered how to synchronize my body and mind through the game. There, I continue to experience rising to the challenge of befriending my Parkinson's diagnosis. There, we are all in this together."

Joseph

Joseph reflected on his journey with MS: "When my father died, his certificate read 'Failure to Thrive.' Those words changed my relationship with MS." He described the biological challenge MS poses: "MS trauma is a constant challenge to thrive. Biology creates thousands of neural network electrical models that sustain life in the central nervous system." Explaining the autoimmune aspect, he noted: "Science is still searching to discover why the immune system of MS patients attacks the nerve's insulation. The attack causes electrical failures in the models."

Joseph adapted a method inspired by a Joseph Campbell' book to cope with MS: "My method for MS remodeling adapts a version of Joseph Campbell's 'Hero's Journey' book. A hero's journey begins when the grief survivor accepts the trauma." Drawing parallels with Star Wars, he noted: "In the Star Wars opening crawl, the 240 words program the audience by describing the wound, trauma, grief, and a promise of heroes.

"In MS, the immune system causes the wound, the damaged network trauma, and grief experience. Our drive to thrive begins the remodel work."

He adds that he sees NeuroPong™ founder Antonio Barbera as "Obi-Wan" when it comes to helping remodel how the body functions.

Upon discovering NeuroPong™, Joseph recognized its innovative approach: "When Dr. Barbera introduced me to NeuroPong™, I instantly recognized he had created new methods to remodel MS trauma." He highlighted the program's effectiveness: "A NeuroPong™ session winds many remodeling techniques together. Unlike clinical therapy, Pong triggers multi-dimensional energy into remodeling."

Laurie

Laurie recounted her journey with Parkinson's: "Many words kept bouncing around in my head: 'You have Parkinson's Disease'; 'It's a progressive condition with no cure'; 'you may be bed-ridden'; 'many people need to go to a nursing home'. Pretty scary stuff!"

She struggled with balance and weakness. "Then, I found the NeuroPong™ Program, offered by Antonio Barbera. This program offers table tennis as a physical activity that may slow down or even stop the progression of our condition.

"Initially, I was off balance, very weak and tired; could not even hit the ball. After a few months, I noticed an improvement in my hand-eye coordination, speed of movements, flexibility and strength."

Unexpectedly, Laurie found camaraderie and joy in the program: "What I did not expect, though, was the amount of laughter that we all share during our classes." She appreciated Antonio's support and community-building efforts: "In addition, Antonio fosters the feeling of a community in which every member has each other's back. I did not have this kind of support before, so I greatly appreciate Antonio's dedication in working with us."

Encouraging others to join, Laurie emphasized: "If you are somebody in search for these opportunities, I urge you to give it a try. You will not regret it."

NeuroPong™ participants play in a multipurpose room at the Har HaShem synagogue in Boulder, Colo.

Pam

Pam, diagnosed with MS in 1991, emphasized the importance of community in managing her condition: "I have always believed that I am responsible for taking care of myself. But I have found that we do not do this disease alone. We need others."

She found NeuroPong™ to be transformative: "NeuroPong™ has been just what I needed. I have met many wonderful people who freely impart their expertise and encourage me to get stronger and people who encourage me to use my brain."

Pam expressed her aspirations through the program: "I hope someday to be able to play ping pong from a wheelchair and be a formidable opponent."

Sandy

Sandy values her table tennis sessions twice a week as transformative: "Where would life be right now without stepping out and going to ping pong twice a week? I look forward to it as one of the highlights of my life."

She elaborates on the benefits: "It's great for me on so many levels. It's easy enough to get started playing without having to be exceptionally good at it, yet it's an infinite challenge of ever more difficult skills and strategies."

Sandy credits the coaches for her progress: "Thanks to the guidance of our coaches, I have a sense of steady growth in my abilities over time."

She highlights the social aspect: “It’s a social outlet—we become friends and compatriots who support each other to grow and stay active.”

And Sandy describes the mental benefits: “I leave our sessions feeling so much more alert and mentally sharp than when I arrived. My brain has had the best workout of the week, and the mood stays with me long after.”

Shirley

Shirley, who has Parkinson’s Disease, was initially skeptical about table tennis for her condition. But she became a true believer in the NeuroPong™ program: “Having lived with Parkinson Disease for over nine years, I am always searching for new ways to improve my condition that doesn’t involve additional medication or medical procedures.”

As she entered the NeuroPong™ gym for the first time, Shirley could feel the energy: “When I first walked in the NeuroPong™ facility in Fort Collins I immediately felt the positive energy. The group was gathering for warm-ups. There was lots of talking, laughing and encouragement.”

She described the physical and social benefits of the program: “As he (Antonio Barbera, the founder of the program) led us through stretches and movements I realized that my limited ping pong experience growing up was not going to suffice for this group. We were expected to use our legs, hips, transfer weight balance and even put spin on the ball. Before I knew it two hours had passed and I had forgotten to take my medication.”

Shirley acknowledged the program’s impact on her symptoms and overall well-being: “The NeuroPong™ Program is not a cure, but I can see the benefits in myself and others with Parkinson’s. I notice improvement in tightness, rigidity, movement and dyskinesia.”

She highlighted the supportive environment of NeuroPong™: “Also, the conversations during water breaks are ‘icing on the cake’. We share symptoms, medication (experiences) and tips on how best to live with our condition. It is also a safe environment.”

Shirley’s favorite outcome was personal validation from her daughter after three months: “In closing, my favorite outcome of NeuroPong™ is when I saw my daughter after I had been playing for three months. After our visit she said I looked really healthy.”

Stacy

Stacy reflects on his experience with the NeuroPong™ program, highlighting its impact on his life with Parkinson’s Disease: “The first thing that strikes you are the sounds. Laughter. Children playing... But wait, this is NeuroPong™; All participants are mid-life to retirement age and older. Still, fun is the order of the day.”

He emphasizes the community and physical benefits: “What has NeuroPong™ meant to me? First, it’s a community of Parkinson’s people who get together twice a week to enjoy friendship and playing ping pong. But it’s much more than that.”

Stacy credits NeuroPong™ with slowing his symptoms: “Over the year and a half that I’ve been a member of the NeuroPong™ group, my Parkinson’s symptoms have progressed very little.”

He appreciates the physical improvements and positive outlook the program has provided: “Playing ping pong, especially doing drills at a high rate of speed, has helped me maintain hand-eye coordination and quickness of movement. NeuroPong™ has also helped me maintain a positive outlook for a future living with Parkinson’s.”

“I thank Antonio and his staff for his vision and his passion in creating the NeuroPong™ program and nurturing it into a self-sustaining community asset.”

NeuroPong™ participants in Ft. Collins, Colo., pose for a photo. Founder Antonio Barbera is in the center in red.

Steve

Steve reminisces about his childhood ping pong experiences and the role of sports in his life: “Growing up in the ‘60s & ‘70s, the main piece of furniture in our basement was a ping pong table. There, I learned the game with my brother as well as some pretty fancy shots and impressive returns. I also picked up a lot of bad habits and forms.”

He discusses his Parkinson’s diagnosis and the importance of exercise: “I was diagnosed with Parkinson’s Disease in 2008, when I was 48 (I am now 65). Exercise and sports have always been a part of my life and big key to slowing the progression of PD.”

Steve praises the NeuroPong™ program for its impact on his symptoms: “I have been playing table tennis now for more than 1 year, since I learned about Antonio’s NeuroPong™ program. Through our warm-up and play time, Antonio has related effective technique to other sports that we are familiar with, like skiing and racquetball.”

He reflects on the rejuvenating effect of playing table tennis: “When I play, I’m concentrating so much on the many variables of getting the ball back over the net (the right way), that I feel my PD related symptoms go away. I feel like I’m a kid again playing table tennis with PD and MS teammates twice a week.”

Ann

Ann describes her journey with Parkinson’s: “I was diagnosed with Parkinson’s in October 2021. I remember being alone in my thoughts for over a

month, not telling anyone outside my family."

She shares her discovery of NeuroPong™ and its benefits: "Fortunately, around Thanksgiving I reached out to someone I knew who was active in the Parkinson's community. I started boxing and attending support group meetings. Sometime later, I kept hearing about a ping pong group. When the group moved to a location near my home, I decided I must give it a try. What a difference!"

Ann praises the structure of the classes: "Antonio is so energetic and takes an interest in each person! We start the class with exercises always seeking to challenge our brains. Then we go to the tables and play. We have been lucky to have experts teach us so our skills improve. Any activity becomes more fun when you get some instruction!"

She highlights the community aspect of the program: "But most of all, NeuroPong™ is about comradery and the new people I have met. We play, we have fun, we share, we care – I look forward to playing every week!"

Ann M.

Ann, diagnosed with Parkinson's two years ago, enthusiastically describes NeuroPong™ as a transformative experience that leaves her energized and mentally sharper. She stumbled upon the program accidentally but now considers herself fortunate for the opportunity it provides to stay active and engaged. Initially unfamiliar with ping pong, Ann credits patient and thorough instruction for quickly acquainting her with the basics of the sport, from holding a paddle to serving and playing games.

She emphasizes the positive impact of the class on her overall well-being, highlighting the fun group dynamics and the noticeable improvement in her cognitive function post-session. She notes she is grateful for the instructors, participants, and the community fostered by NeuroPong™.

Al

"It was around my 70th birthday when I first noticed the symptoms of Parkinson's Disease," he recalled, Al recalled, adding that he was aware of a loss of "coordination and dexterity in my fingers when I played saxophone, my diminished posture and slowed gait on gigs, my lack of energy and drive to practice."

He expresses gratitude for the positive impact of the program: "I just turned 74 last week and I find that NeuroPong™ has helped me regain some of the focus I'd known for 30+ years, adding new acquaintances and friendships among people who can relate to my personal challenges."

Al emphasizes the benefits of the program in his daily life: "It gives me another reason to get out of bed and do my stretches. It provides me with a new discipline to pursue and new skills to learn each day.

"And most importantly … I'm having fun again!"

Antonio Barbera, standing in black, gives some advice to a group of NeuroPong™ particpants at the annual Huntsman World Senior Games in St. George, Utah.

Debbie

Debbie recalls being immediately drawn to the NeuroPong™ Program after reading a flyer and hearing Antonio speak to her boxing group. “I thought this is for me!” she says, recalling that she grew up playing ping pong with her dad. Diagnosed with Parkinson’s nearly 12 years ago, Debbie emphasizes the importance of staying active, challenging the brain, and staying connected—”all these keys are NeuroPong™.”

Joining on day one, Debbie found the program wonderful. She highlights the physical benefits, explaining that the warm-up exercises and playing ping pong help with “the stiffness and slowness I have from PD,” and emphasizes the safety of movement skills. NeuroPong™ provides her with “much-needed movement with challenge and fun.”

Debbie also appreciates the mental stimulation. The coordination required in ping pong “does indeed challenge my brain,” especially as she breaks old habits and learns new techniques. Playing with people of various abilities and styles further benefits her brain.

What makes the program truly special for Debbie is “the people.” She values the supportive and positive friendships formed in the group, enjoying shared stories about family, travel, and hobbies. “I always look forward to seeing these friends and meeting new ones,” she says, appreciating the shared learning, smiles, and laughter that keep them all connected.

Paul

Paul describes Parkinson's Disease (PD) as "an insidious condition" often misunderstood as solely a movement disorder. While most people recognize it for causing shaking or writhing, they "probably don't know that it disrupts temporal/spacial perception and proprioception," which is the ability to be fully aware of where your body is as it moves through space. Paul notes that playing ping pong can help with these issues.

He also highlights that PD has many non-motor symptoms due to the lack of dopamine, such as "depression, anxiety, apathy and fatigue." These symptoms can lead to isolation, as many People with Parkinson's (PWP) find it "too hard or embarrassing to get out of their house." According to Paul, the best thing about NeuroPong™ is "the community feeling it has developed, and the incentive and inspiration it provides." He emphasizes that "looking forward to the activity and seeing your friends there is more valuable than any other therapy available."

Dave

Dave notes the impact of joining the program on his life: "I heard about ping pong as a possible beneficial activity for Parkinson's Disease from Antonio in the summer of 2022." He explains his decision to join NeuroPong™: "He came to the Parkinson's Association of the Rockies Power Punch Boxing class at Title Boxing to talk about it. It sounded interesting and fun, so I started his NeuroPong™ class in September of 2022 and have continued ever since, twice a week whenever possible." His wife Mary Ellen Holmes, also participates. "We enjoyed playing enough that we bought our own table and put it in a bedroom in the basement, displacing a spare bed," Dave notes. "Having 2-4 people at the same table gives a good opportunity to talk and get to know each other. Of course, neither did playing at home have the obvious benefit of instruction by Antonio and others, or the group warm-ups. Antonio has been incredibly generous with his time and attention in all of this. I consider myself very lucky to have met him and worked with him".

Mary Ellen (Dave's wife)

Mary Ellen learned about NeuroPong while at a presentation by Antonio at a Parkinson's Boxing Class that her husband, Dave, was taking. "I love David (who has Parkinson's) and physical activity, so I go to these therapies," she notes. Antonio highlighted the program, emphasizing hand-eye coordination, movement, and emotional engagement, and they decided to try it.

During an early class, Antonio invited her to play table tennis along with her husband, reassuring her of her importance of being a part of the group, saying, "you are a member of this community and your value as a person is not different than that of anybody else."

Mary Ellen appreciates that each class begins with specific exercises, noting that Antonio's instruction is "extremely logical yet at the same time, playful," which brings joy to the sessions. She has observed the progress of participants. "Even the people who are nearly 'frozen' by Parkinson's are moving with more fluidity and standing straighter, and even hitting the ball!

"Perhaps most importantly, we are a supportive community. It's not unusual, as the class progresses, to see groups of us sitting, talking, watching, laughing. It just makes life better.

Thank you Antonio!"

NeuroPong™ participants at the Huntsman World Senior Games in Utah lead the Table Tennis sports division during the Opening Ceremonies Parade.

Dee

Dee shares her 28-year journey with MS, which included being virtually quadriplegic in 1995. Through "good fortune, hard work, a feeding tube and appropriate therapies and medication," she has regained much functioning. Dee continuously seeks out "affordable and fun methods to retrain my brain and body."

In December 2022, she attended an introductory meeting about NeuroPong™. Initially skeptical and thinking she was "too disabled to play," she participated while holding the table for balance. That night, she felt new sensations in her left leg, signaling positive changes.

Since then, Dee has attended classes regularly, making significant gains. She describes the program as "a fun and interesting way to gain strength, stamina, coordination and confidence," while enjoying the company of motivating and inspirational people. Dee finds NeuroPong™ to be "a fun, low-risk, high-reward activity to potentially address neurological challenges head-on."

Dee says the program has improved her coordination, strength and confidence, and she values the supportive community she has found. She praises Antonio for setting "a tone of lightheartedness, humor and positivity," which makes the challenges seem less daunting.

Gill

Gill started the program a year and a half ago, but hadn't played ping pong since high school. Diagnosed with Parkinson's ten years ago, he initially didn't expect significant benefits but has been pleasantly surprised.

Despite suffering from low back pain that limits his standing or walking to minutes at a time, he finds relief while playing table tennis. "I can actually play for an hour at a time without pain," he says, attributing this to the combination of "positioning, movement and concentration."

Gill has noticed significant improvements in his agility and reflexes, making him quicker and better at retrieving balls. He believes these skills will be useful if he falls. Multi-tasking, a challenge with Parkinson's, has also improved. Initially struggling with corrections, he can now make "a whole variety of changes" to his technique "on the fly."

Deborah

Deborah shared her transformative experience with NeuroPong™, describing how she initially hesitated but was encouraged by fellow Parkinson's fighters from her Boxing For Parkinson's class. She recounted her first impression: "I hadn't laughed so much in ages." She was hooked. After six months, Deborah noted significant improvements: "Not only improvement in my ability to play the game, but a marked improvement in my movement from the start of each class to the end of it."

She highlighted the impact on her dyskinesia: "If I'm struggling with dyskinesia...the shaking is essentially gone by the end of class." Deborah also observed enhanced speed and mood: "I'm also moving more quickly during class. I have also noticed an improvement in my mood and general state of being…the laughter continues.

"Not only is it an effective exercise modality but it's.. FUN!"

Jerry (from his wife, Peggy)

Peggy expressed her amazement at the impact of people like Antonio Barbera, who runs the NeuroPong™ program. She discovered NeuroPong™ through a newspaper article and felt excited as she read more about it.

She had been searching for an exercise program suitable for her husband, who has Alzheimer's, and NeuroPong™ seemed perfect. "We walked into the gym and Antonio engaged with my husband, introduced him to the group, and they began warming up and playing ping pong." Watching her husband participate, Peggy observed him improve right away. "The man I've been married to for 53 years came back to life."

"When he is at NeuroPong, I see him return to the fun, active, athletic wonderful guy I love!" He enjoys the social interaction and exercise, becoming much happier and more appreciative. "He laughs, jokes, talks and gets the exercise he needs and loves. He sleeps better, hydrates more and he is happier."

Mark

Mark, a 73-year-old diagnosed with Parkinson's four years ago, was thrilled to find a ping pong class tailored for people with his condition. "I had played ping pong off and on throughout my life and loved the game, so this would give me another enjoyable exercise opportunity to help minimize the progression of my disease," he noted. Mark soon realized the class focused on physical therapy, using ping pong as its primary vehicle. He appreciates the warm-up exercises and individual attention, noting, "Antonio instructs and guides participants based on where they are in their ability, always encouraging each to try to reach their personal next level."

Mark observes that every participant has improved not only in ping pong skills but also in overall movement and agility, which is crucial for those with Parkinson's. He feels the quick decision-making and agility required in ping pong offer a significant benefit: "When I am playing ping pong, I feel my Parkinson's symptoms temporarily melt away."

Mark also highlights the unexpected social benefits, which include the sharing of experiences, forming valued friendships with others, and creating a supportive community.

As for the future:

"I am planning to continue to work hard attempting to rewire my brain and body to slow the effects of Parkinson's progression through the NeuroPong™ program, with the hope of also becoming a better ping pong player."

Showcasing participant achievemets

Welcome to the collection of NeuroPong™ participant videos. These videos showcase the unique challenges and achievements of individuals with neurodegenerative conditions as they engage in various NeuroPong™ exercises. Each participant's journey is highlighted to demonstrate the program's impact on their physical and mental capabilities, underscoring the importance of personalized coaching and support.

Ball Hit to the Ground (PD)

Both Mark (left) and Paul (right) practice hitting a ball inside the ring of a hula hoop.

Ted and Mark hit the ball to the ground using backhands.

Joseph's Journey (MS)

Joseph is performing the hand scissor exercise with Gail, a volunteer. His right hand shakes, and he loses the ball easily because of forearm control. After further instruction by Gail (trained in NeuroPong™), he was able to perform the exercise correctly. Gail invited Joseph to breathe and to relax, two very important activities for controlling our movements.

Joseph realized that keeping the ball in his right hand was helping him to better perform the exercise; he was feeling more control in moving his legs up and down. Sometimes, the body's performance needs the help of many senses at once.

Joseph practices a variation of the toss, touch, grab exercise using the background color of the table for contrast.

At the beginning of the rally, Joseph's movement was very abrupt and stiff, and he was losing control. After being invited to relax, he was able to be more fluid in his stroke.

Joseph was very relaxed and in control of his transition from backhand to forehand.

Rich's Progress (PD)

After touching the ball with either forehand or backhand, Rich was encouraged to take a little step before each stroke.

We had to control Rich's exuberance, inviting him not to jump so much on his toes and to keep more contact with the ground.

Robot Drills (PD)

Debbie is correcting on-the-fly the follow-through of her forehand. She likes to be instructed by having immediate feedback to improve her stroke. Other participants may feel overwhelmed if given immediate feedback while they concentrate on the exercise; they may prefer feedback it during breaks or at the end of play.

Paul is not aware of his uncontrolled movements of his right wrist and the elevation of his right elbow. To increase the effect of table tennis on neuroplasticity, he has taken NeuroPong™ to another level: he started playing with his left hand!

Shirley is moving her right wrist in an unconscious and uncontrolled way. This may actually help her in the time management prior to executing the stroke.

Steve felt overwhelmed at the beginning of the drill until he realized he was able to manage the speed of the ball coming at him.

Ted's PD makes him very stiff, but he is able to loosen up when he plays table tennis.

Wade (MS)

Wade's lower extremities make him very stiff and walking may be very difficult at times. Wade now is able to move side to side on the table, sometimes using his hand for support.

Toss, Touch, and Catch

People living with Multiple Sclerosis may have weakness in the forehand muscles and may need to perform in a different way.

People with Parkinson's may have stiffness and rigidity (cog-wheel rigidity at the elbow).

People with Parkinson's may not be in control while multitasking, but have shown improvement after several weeks in the program.

Pam's Development (MS)

Pam's Multiple Sclerosis makes her upper extremities very weak. We are waking up neuro pathways by repeating the same motion.

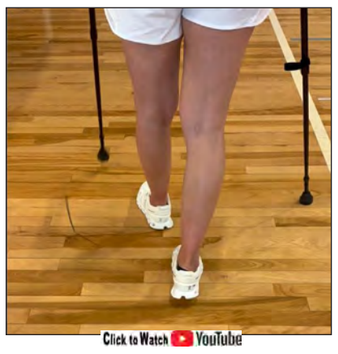
Even though Pam is still supporting her weight on the left armrest of her chair, she was invited to move forward and engage her core.

In feeding the ball to Pam, we went from a standing to a seated position. That gave the coach the same perspective that Pam was experiencing, improving the quality of the feeding process and Pam's shots.

Video 4: Alternating Backhand and Forehand Pam decided to engage her core even more, positioning the chair facing straight to the table baseline. Alternating backhand and forehand was a big energy expenditure for Pam, presenting challenges in maintaining a strong and efficient grip of the paddle.

Michelle's Progress (MS)

Michelle walked constantly using two poles and had severe stiffness in her left leg. Her gait was characterized by moving her left hip forward without bending her left knee nor landing her left step on her heel.



After 3 months in the NeuroPong™ Program, Michelle walks forward without pushing her left hip first, bends her left knee, and lands on her left heel.

While lunging, Michelle focuses on allowing her left hip to drop, bringing her left knee forward, and bending her toes.

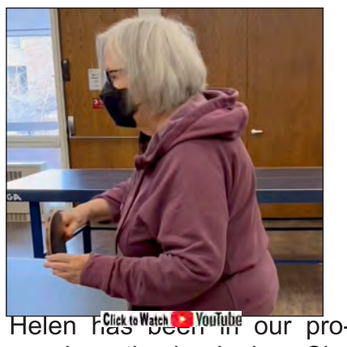
Michelle is still holding onto the table with her right hand, but has good contact with the ball and can rotate her pelvis while performing a forehand shot.

Michelle learned how to rotate her pelvis while performing a forehand shot. Even if she occasionally holds her right hand on the table, she can move in the transition from her backhand to her forehand.

Laurie's Determination (PD)

Laurie started the program experiencing severe dyskinesia of both her upper and lower extremities. After constant determination, she was able to move from side to side of the table, switching from backhand to forehand. She can perform the exercise of striking/bouncing the ball with her foot, trusting her standing leg and executing a complex and coordinated series of movements.

Helen's Confidence (PD)

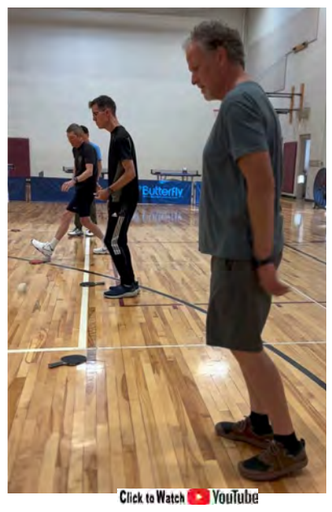


Helen has been in our program since the beginning. She only played backhand because she felt anxious and unsafe with movement. After several months, she asked to learn the forehand, accepted the challenge of moving her feet, and after a month was hitting forehand shots. She now shares her success and smile with other participants, encouraging them to accept challenges for their brain and body.

Gil's Adaptations (PD)

Parkinson's can affect depth perception. An obstacle, in this case, a jacket, was used to assist Gil in assessing proper placement of the ball.

While lunging with his right leg forward, Gil had difficulty keeping his left leg in alignment, as his hip was rotating outwards.



Lunging with his left leg forward, Gil was able to keep proper alignment in his right leg, which he visually confirmed, illustrating the effect of proprioception.

Dee's Improvement (MS)

When Dee first joined the NeuroPong™ Program, she walked using a cane and needed to hold onto the table for balance. Over time, she learned forehand and backhand shots, eventually walking without her cane and no longer needing to hold onto the table. Improved balance came from consciously engaging her core muscles and quadriceps.

Dee showed better control in her left hand. Initially needing to be seated for complex exercises, she can now perform them standing due to improved balance.

Dementia

People living with Dementia (three videos above) generally have normal mobility but may need instructions delivered in different ways, such as verbally or by demonstration. NeuroPong™ coaches should connect with dementia support groups to learn to communicate respectfully with these participants.

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