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SHAKING, SLOW MOVEMENTS, AND SCIENCE: DISCOVERING PARKINSON'S DISEASE

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YOUNG REVIEWERS:

AKSHAYAN
AGE: 11

PEDRO
AGE: 12

This article is about Parkinson's disease, a condition that affects the brain and makes it hard for people to control their movements. It explains the main symptoms, like shaking, slow movements, and stiffness, and how Parkinson's can also affect sleep, memory, and emotions. The article discusses how doctors diagnose Parkinson's and the early signs that might appear before movement problems start. It also covers the treatments available, such as medications, physical exercise, and therapies that can help manage the symptoms. By understanding more about Parkinson's disease, kids, parents, and teachers can better support loved ones with this condition and learn how to help them stay healthy and happy.

JOSEPH AND HIS GRANDPA JOE

Joe is an older man who loves spending time with his 12-year-old grandson, Joseph. One day, while sitting on the porch, Joe noticed Joseph's worried look. "Grandpa, why do you walk so slowly and sometimes seem stuck to the floor?" Joseph asked. Joe smiled gently and said, "Joseph, I have Parkinson's disease (Figure 1). It makes my movements slow, and sometimes my feet feel glued to the ground. I also have trouble sleeping, and sometimes my memory is not as good as it used to be". Joseph listened carefully as Joe continued, "But do not worry, I am getting help from the healthcare team to manage it. It is not easy, but having you around makes it better". Later that day, Joseph and Joe went to see Dr. Smith, a **neurologist** who specializes in movement disorders like Parkinson's disease. Dr. Smith had been helping Joe manage his Parkinson's disease for some time.

NEUROLOGIST

A doctor who helps people with problems in their brain, nerves, and muscles.

Figure 1

Dr. Smith explaining to Joseph about the motor and non-motor symptoms of Parkinson's disease.

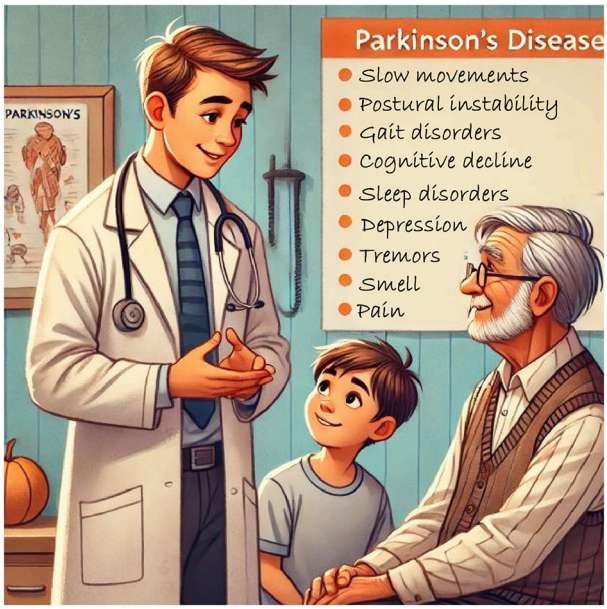

Figure 1

WHAT IS PARKINSON'S DISEASE?

Joseph sat with the doctor and asked, "Can you tell me what Parkinson's disease is?"

Dr. Smith smiled and explained, "Sure, Joseph. Parkinson's disease is a condition that affects the brain and makes it hard for people to control their movements. It happens because the brain does not make enough of a chemical called **dopamine**, which helps the brain send signals for movement. This can cause **motor** signs (signs are what doctors can measure or see), like shaking, muscle stiffness (where the muscles feel tight and hard to move), and slowness of movement. There are also motor symptoms (symptoms are what the person with Parkinson's

DOPAMINE

A brain chemical that helps send signals to control movement. In Parkinson's disease, the brain does not produce enough dopamine, leading to movement difficulties like shaking and slow movements.

MOTOR

Related to movement, like how your arms, legs, or fingers move.

feels or experiences), like difficulty walking, speaking, or writing. But Parkinson's disease also has non-motor symptoms that affect other parts of the body, including constipation, trouble sleeping, losing the sense of smell, and feeling tired or sad. Even though there is no cure yet, there are treatments that can help manage these symptoms and make life easier for people with Parkinson's [1].

PARKINSON'S IS A CHRONIC CONDITION

Joseph asked, "Can the symptoms of Parkinson's disease ever just disappear?"

Dr. Smith gently said, "Parkinson's disease is a chronic condition, which means it does not go away completely. However, sometimes medications or treatments can help reduce the symptoms for a while, making them seem like they have disappeared. For example, some people take levodopa, which helps replace the dopamine that the brain is not making. This can help with the tremors, stiffness, and slowness, making moving easier".

Joseph nodded but still looked curious. "But why does levodopa not cause the symptoms to go away forever?" he asked. Dr. Smith continued, "Well, over time, the brain keeps losing more of the **neurons** that make dopamine, so the medicine might not work as well as it did before. This means the symptoms can come back eventually, and sometimes, even with the medication, people might experience "off periods", when the medicine stops working for a little while. It is not that the symptoms disappear completely, but treatments can make a big difference in helping people with Parkinson's live better, more comfortable lives". Joseph thought momentarily and then asked, "So, will Grandpa always have Parkinson's?" Dr. Smith nodded, "Yes, but with the right treatments, exercises, and support from people like you, Joseph, we can help him manage the symptoms and stay as healthy as possible".

NEURONS

Tiny parts of the brain and body that send messages to help you think, feel, and move.

BRAIN CHANGES IN PARKINSON'S

Joseph asked, "You mentioned stiffness. What does stiffness mean?" Dr. Smith nodded and explained that stiffness means the muscles are tight, as if they cannot relax. It makes moving your arms or legs hard, like when you are trying to bend or stretch them. Joseph asked the doctor, "What happens to the brain's neurons in people with Parkinson's disease?" The doctor took a deep breath and began, "Good question, Joseph. In Parkinson's, a part of the brain called the substantia nigra starts to get sick. The neurons there, which normally make dopamine, stop working properly and begin to die. Then, the brain does not have enough dopamine, making it hard to control muscles and movement. Other changes happen in the brain, too.

Some brain parts might start to shrink, and clumps of proteins called **Lewy bodies** can build up inside the neurons. Lewy bodies can cause problems with movement and affect thinking and emotions. The brain's messaging system gets messed up, making it harder for the body to move the way it should and causing issues with how the person feels and thinks. If certain brain parts are affected, problems with balance, memory, and even sleeping can occur. This means that people with Parkinson's might have trouble remembering things or might feel very tired during the day because they cannot sleep well at night. These brain complications make Parkinson's a very challenging disease, affecting many aspects of a person's life".

LEWY BODIES

Clumps of protein that build up inside neurons in the brains of people with Parkinson's. They can cause problems with movement, thinking, and emotions by disrupting the brain's messaging system.

Joseph then asked, "Why does the brain stop making enough dopamine in people with Parkinson's disease?" "That's another great question, Joseph", Dr. Smith answered. "For reasons scientists are still trying to fully understand, dopamine-producing neurons break down and die over time. We think this may be caused by a combination of things, like changes in certain proteins in the brain, genetics, and even environmental factors".

SIGNS AND SYMPTOMS

Joseph, always curious, asked the doctor, "Are there any signs of Parkinson's disease before the movement problems start?" The doctor nodded and explained, "Yes, Joseph, there are early signs. For example, some people might have a sleep problem called REM sleep behavior disorder, in which they act out their dreams and move a lot. Others might lose their sense of smell. Constipation is another sign that can happen because Parkinson's affects the nerves that help control the intestine. These signs can appear years before the more obvious movement problems start to show. Not everyone gets these early signs, and not everyone with these signs will have Parkinson's, but they can be important clues for doctors".

TREMOR

Involuntary shaking or trembling, usually of the hands or other parts of the body, that occurs even when the person is resting. It is a common symptom of Parkinson's disease.

BRADYKINESIA

Moving very slowly, which can make everyday tasks take longer.

Wanting to understand more about his grandpa's condition, Joseph asked the doctor, "What kind of movement problems does Parkinson's disease cause?" The doctor explained, "In Parkinson's disease, people often have a **tremor**, which means their hands or other parts of their bodies shake even when they are resting. They might feel stiffness in their muscles, making it hard to move around easily. Moving slowly, called **bradykinesia**, is another common problem; getting dressed can take much longer, for example. Sometimes, their feet might feel stuck to the floor, and it might be difficult to walk, which is called freezing of gait. This can happen more often in tight spaces or when turning. People with Parkinson's might also have trouble with balance, making it easier for them to fall. Their posture can become hunched over, and their movements might become smaller and slower, making activities like writing or tying shoes difficult. These movement problems happen

because the brain is not sending the right signals to the muscles, making it hard to control their body the way they want to".

BEYOND MOTOR SYMPTOMS

Joseph asked the doctor, "Can Parkinson's disease affect a person's thoughts or feelings?" The doctor nodded and said, "Yes, Joseph. Besides movement problems, Parkinson's can also cause psychological or **cognitive** issues". "What does cognitive mean?" Joseph asked.

COGNITIVE

How we learn, think, and remember things.

Dr. Smith responded, "Cognitive means how we think, learn, and remember things. Parkinson's can make it harder to think quickly or remember certain details. Some people might have trouble with memory, thinking, and making decisions. Depression and anxiety are also common, making people feel very sad or worried without a clear reason. Some people might act impulsively, doing things without thinking about the consequences, which can affect their behavior and relationships. These problems happen because Parkinson's disease affects different parts of the brain, not just the areas that control movement. People with Parkinson's need to get support for both their physical and mental health". Joseph felt more empathy for his grandpa, understanding that the disease affected more than just his movements.

DIAGNOSING AND TREATING PARKINSON'S

Joseph asked, "How do doctors determine if someone has Parkinson's disease? Are there any special tests for it?" The doctor replied, "Great question. Doctors usually diagnose Parkinson's by looking at a person's medical history and doing a physical exam (Table 1) [2]. If they are not sure, they can do a test called a dopamine transporter SPECT scan. This scan helps see how much dopamine is in the brain. In Parkinson's, less dopamine shows up on the scan. Another type of scan called magnetic resonance imaging (MRI) is like a super camera that can help to show differences between Parkinson's and other similar conditions. MRI uses magnets and radio waves to take detailed pictures of the inside of the body, like the brain or muscles. The best part? It doesn't hurt at all!"

Joseph asked, "How fast does Parkinson's disease get worse?" The doctor said, "It depends on the person. Some people get worse slowly, while others get worse faster. How quickly the disease progresses can depend on a person's symptoms and how well they respond to medications".

Curious about how to help, Joseph asked, "What treatments are there for Parkinson's disease?" The doctor smiled and said, "There are several ways we can help people with Parkinson's. Medication

Table 1

Main symptoms of Parkinson's disease and how families can help.

Symptom	How families can help
Tremor (shaking)	Help with tasks that need steady hands, like buttoning a shirt, tying shoelaces, or holding a cup without spilling.
Muscle stiffness	Encourage gentle stretches or help with daily tasks like reaching for things, getting dressed, or opening jars.
Slowness of movement (bradykinesia)	Be patient and allow extra time for activities like getting out of bed, eating meals, or walking to the car.
Difficulty walking or freezing of gait	Clear clutter and make sure there are no tripping hazards at home. Offer an arm for support when walking together.
Sleep disturbances	Help set up a relaxing bedtime routine, like reading a book or listening to calming music before bed.
Depression or anxiety	Spend time together doing fun activities, listen to their concerns, and encourage them to talk to a doctor about it.
Trouble with balance	Remove things like rugs or cords that might cause a fall and walk beside them if they feel unsteady.
Memory problems	Offer gentle reminders for important things, like taking medicine or remembering appointments.

Table 1

is one important treatment. Drugs like levodopa can help increase the dopamine levels in the brain, making it easier to move. Other medications can help manage other symptoms. Exercise is also important [3]". Joseph then asked, "What is the difference between physical activity and exercise?" Dr. Smith replied, "Physical activity means doing things that move your body, like walking to school or playing outside. Exercise is a special type of physical activity planned to help you stay healthy, like doing stretches or running. For people with Parkinson's, exercise, such as specific movements or stretches, can help keep their muscles strong and flexible, while physical activity keeps them moving throughout the day. Sometimes, speech and occupational therapy are useful too. Speech therapy can help people with Parkinson's speak clearly and occupational therapy can help them do everyday activities more easily. It is all about finding the right treatments to help each person feel their best". Joseph felt hopeful, knowing that there were many ways to support his grandpa's health and wellbeing.

HOW CAN FAMILIES HELP?

Joseph asked, "How can I help my grandfather?" Dr. Smith took out a notebook and made a table for Joseph. "There are many ways you can help someone with Parkinson's, Joseph. You can be patient with them, especially when they move slowly or struggle with everyday tasks. If your grandpa's hands are shaking, you can offer to help with things that are hard to do, like buttoning his shirt or carrying his cup of water. Ensure the house is safe by clearing things that could cause him to trip, like rugs or toys. You can also remind him to take his medication or help him keep track of appointments. Most importantly, spending time

together and being there for him when he feels sad or tired will make a big difference. Just knowing that he has your support can help".

Finally, Joseph asked, "Can people die from Parkinson's disease?" The doctor explained, "Most people with Parkinson's die from the same things as other people their age, like heart disease. But if someone has Parkinson's for a long time, they might die from things related to the disease, like lung infections from swallowing problems or injuries from falls".

After learning so much about Parkinson's disease, Joseph felt a mix of emotions. He now understood that his grandpa's slow movements, shaking, and stiffness were because of the disease, but also that it affected his grandpa's sleep, memory, and feelings. He realized that Parkinson's disease is complicated, affecting multiple parts of the brain and causing a range of symptoms. Even though there is no cure yet, Joseph was glad that doctors could help manage the symptoms and support his grandpa. Feeling more informed and empathetic, Joseph promised to be there for his grandpa and help him as much as possible.

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CONFLICT OF INTEREST: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

YOUNG REVIEWERS

AKSHAYAN, AGE: 11

Akshayan is a boy who likes Lord of the Rings and 21 Pilots. He plays guitar and drums, and thinks boys can have long hair too. He likes singing and he is going to perform in an opera at school. He is very excited about it. He thinks this Bio is awesome.

PEDRO, AGE: 12

I am 12 years old and in 6th grade in a South American country. I really enjoy drawing, playing with action figures, and I love math. I also love gaming, especially Roblox.

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Nathalia, 25 years old, is a physiotherapist specializing in adult neurological patients and elderly health. Doing research in the Neurosciences and Cognition Program at UFABC, she focuses on neuroimaging and individuals with Parkinson's. The main target audience of her research is elderly people, providing personalized care and treatments to improve their quality of life. Dedicated to her scientific career, Nathalia is constantly involved in innovative research, publishing her results in specialized journals and contributing to the advancement of neurosciences and clinical practice.

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Layla is a physiotherapist from the Federal University of Bahia (UFBA). She dedicated herself to the field of gerontology. She went on exchange to the University of the West of England. She is currently part of the Neural Correlates of Balance and Gait study group, where she researches Parkinson's disease.

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