Background and Market Research

written by AJ 03/21/2025 - 04/26/2025, edited by VD, JB 04/27/2025, edited by SH 04/29/2025 Parkinson's disease is a neurological disease that affects many individuals in the United States and around the world. It is an age-related degenerative brain condition in which the basal ganglia deteriorates, causing a loss of motor-related functions(Cleveland Clinic, 2022b). It typically affects individuals who are 60 years or older, but while rare, it can appear in individuals as young as 20 (Cleveland Clinic, 2022).

Specifically, Parkinson's occurs in individuals due to a loss of dopamine. The loss of dopamine is caused by excessive death of dopamine cells, which are responsible for producing dopamine; however, the cause of this uncontrolled death is unknown. Dopamine is an essential neurotransmitter that affects many aspects of both the mental and physical health of an individual. In the brain, dopamine leaves one neuron and travels through the synapse to collide with a receptor on a neighboring neuron. This collision then leads to a chain of events that result in movement or feeling. With little dopamine, there can be unnatural movements, irregular feelings, and uncontrollable actions (Cedars-Sinai Staff, 2017). While affecting mainly dopaminergic neurons, Parkinson's also occurs when there is a loss of norepinephrine-producing cells, which produce norepinephrine, a neurotransmitter associated with automatic functions of the body such as pulse and blood pressure (National Institute of Neurological Disorders and Stroke, 2025).

Due to the lack of dopamine and norepinephrine, one of the most common symptoms is tremors, which usually begin in the hands or fingers and eventually move to the rest of the body as the condition worsens (Mayo Clinic Staff, 2024). Tremors occur in around 80% of individuals with Parkinson's, although they can vary in severity depending on the person (American Parkinson Disease Association, 2017). These tremors normally occur when a hand or fingers are held in one position for an extended period of time, such as when holding utensils or dishes. They are also normally asymmetric, typically occurring on only one side of the body (American Parkinson Disease Association, 2017).

Another common symptom of Parkinson's is rigidity, which is experienced by approximately 90% of those with Parkinson's. Rigidity is when muscles feel stiff and tighten involuntarily, and this can occur in the arms, legs, neck, back, and other similar areas. Some people experience this symptom in one side of the body, and some experience it in both; however in both scenarios, it can lead to extreme joint pain. There are two main types of rigidity: lead pipe, which is where the body part is stuck in one position, and cogwheel rigidity, which is small-jerky movements. Often, cogwheel rigidity can manifest itself as tremors (*Rigidity and Parkinson's*, 2020).

While rigidity and tremors are the most common symptoms of Parkinson's, many other symptoms can manifest based on the individual. These symptoms can be split into motor-related and non-motor-related. Motor-related symptoms include bradykinesia, also known as slowed movements, unstable posture and balance, changes in writing and speech, and loss of automatic movements (Mayo Clinic Staff, 2024). Non-motor-related symptoms include depression, anosmia – loss of sense of smell, sleep problems such as sleep apnea, and other autonomic nervous system issues (Cleveland Clinic, 2022).

Due to these symptoms, individuals with Parkinson's face a lot of issues. Rigidity and tremors can make holding objects difficult. This can make it difficult to hold toothbrushes, razors, hair dryers, and utensils when eating. Cutting and slicing can also be difficult (Assistive Technology & Devices, n.d.). Due to changes in speech and handwriting, communication also becomes more complicated and time-consuming (Mitnick, 2023). Due to gait changes and other muscular issues, the risk of falling increases significantly. Getting into and out of a bathtub or chair can become near impossible. All of these can lead to extreme fatigue due to the extra effort necessary to perform basic tasks (Living with Parkinson's Disease, 2023).

While there are theories about the cause of Parkinson's, there is no known cause as to why the dopamine cells die, thus making it difficult to find a cure; however there are some treatments that can help alleviate symptoms. These treatments can fall into three categories: supportive therapies, medication, and surgery. Supportive therapies include physiotherapy, which works to relieve muscle stiffness and joint pain to make moving easier; occupational therapy, which helps work out practical solutions for areas of difficulties in everyday life; and speech and language therapy, which can help improve issues with dysphagia and speech by teaching speaking and swallowing exercises or by providing assistive technologies. Medications include levodopa, which is absorbed by the nerve cells in the brain and turned into dopamine and includes side medication, dopamine agonists, which act as a substitute for dopamine and have similar but milder effects compared to levodopa, and monoamine oxidase-B inhibitors such as selegiline and rasagiline, which block the effects of the enzyme that breaks down dopamine thus increasing dopamine levels. The only available surgery for Parkinson's is deep brain stimulation (NHS, 2022).

Deep brain stimulation refers to when electrodes are inserted into the target area in the brain, which is either the subthalamic nucleus or pallidus interna, using MRI. Following this, an impulse generator battery is implanted in some other area of the body and is used to deliver the stimulation to the electrodes. The results from this can last for up to 5 years, however, it only works to relieve tremors or dyskinesias (Parkinson's Foundation, 2023).

Tremors are a huge issue faced by people with Parkinson's. These tremors can take away their independence, forcing them to be reliant on others for simple tasks, such as feeding themselves. As such, our device aims to allow individuals with Parkinson's to be able to feed themselves, reducing spillage when they eat. Through this, the device will help them gain back their independence.

Some studies believe TENS units hold the potential to aid those with tremors. TENS (Transcutaneous Electrical Nerve Stimulation) units use low-voltage electrical currents that are sent through electrodes connected to a battery to reduce pain or change the perception of the pain. These electrodes are placed near trigger points or affected nerves. The electrical current sent by the TENS unit travels through the skin and stimulates various nerve cells that can then block the transmission of pain signals (Cleveland Clinic, 2020).

Recently, TENS units have started being used to treat movement disorders. TENS units stimulate the large, myelinated peripheral proprioceptive A-beta (A β) sensory fibers, which are hypothesized to be involved in tremor generation. As such, many studies suggest that a TENS system can improve muscle strength and reduce tremors in patients who experience tremors. Two electrodes, when used for tremor reduction, can be placed over the median and radial nerves on the anterior surface of the wrist, and a counter electrode can be placed on the posterior surface of the wrist resulting in a 57% tremor suppression. Thus, TENS units have been hypothesized to be very beneficial in tremor suppression (Mo & Priefer, 2021).

Due to the prevalence of Parkinson's and tremors being one of the biggest symptoms of

Parkinson's, there are many devices found on the market that aim to assist those with tremors.

Name of Device	Picture	Pros	Cons	Improvements
Gyenno Parkinson Spoon (Amazon.com, 2025)	B and	 Collects user tremor data and displays it High-precision digital motor Claim 85% tremor suppression Detachable head (interchangeable) 	- Expensive (\$299.99) - Potential for malfunction	Our device will make the device much cheaper and potentially with no motor, to prevent potential for malfunction.
Liftware Steady (deLeeuw, 2021)		 Reduces tremors by 70% Dishwasher safe Rechargeable battery 	 Expensive (\$195) Easily damaged if wet Highly likely to be dropped 	Our device will make the device much cheaper. We will also reduce electronic components (sensors, etc.) to prevent damage.
Adaptive Eating Utensils by Celley (Amazon.com, 2025)		- Cheap (\$15.99 to \$22.85) - Dishwasher safe - Easily graspable	- Less effective at reducing effects of tremors	Our device will incorporate multiple ideas to ensure the device mitigates the effects of tremors.
Cala Trio (Mo & Priefer, 2021)	trio	- Lowers tremors - Easy to wear	 Causes skin irritation Causes soreness or lesions Discomfort when wearing 	Our device will create a padding to ensure minimal irritation and discomfort when in use.

Tremelo utilized two tuned vibration absorbers (TVAs) (Mo & Priefer, 2021)	 85% tremor suppression Non-invasive Can be used discreetly (under clothing) 	 Allergic reactions are possible Can cause skin irritation 	Our device will use safe material that is comfortable to prevent reactions.
SP Ableware Covered Spoon (Amazon.com, 2025)	 Cheap (\$1.42/spoon) Dishwasher safe Cover is detachable Lowers spillage when eating 	 Can only be used with smaller foods and liquid Spillage still occurs Significantly heavier than normal spoon 	Our device will design a low-weight but larger head utensil to ensure comfort and cover the entire head to minimize spillage.
Seal Spoon (O'Brien, 2021)	 Cheap (\$0.80 to \$2.00) Personal connection Cover can be fully taken off High predicted revenue 	 Not an actual product as of now (patent pending) Sliding might be difficult for those with tremors Time consuming to slide back and forth every time 	Our device will automate the spoon to allow for faster user times and ease of use.

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