Medtronic

Scientific compendium

BrainSense™ Adaptive Deep Brain Stimulation (aDBS)†

Research on sensing-enabled, adaptive deep brain stimulation with BrainSense™ technology‡

† aDBS is only approved for patients with Parkinson's disease.

‡ The sensing feature of the Percept™ PC system and Percept™ RC system is intended for use in patients receiving DBS where chronically-recorded bioelectric data may provide useful, objective information regarding patient clinical status.

Introduction

This scientific compilation of published literature is intended as an educational resource for health care professionals interested in adaptive deep brain stimulation (aDBS) in patients with Parkinson's disease.

This resource begins by demonstrating the association between local field potential (LFP) signals sensed from the brain and the symptoms of Parkinson's disease. These signals can be sensed using the Percept™ PC and Percept™ RC devices with BrainSense™ technology. The following sections provide published examples of LFP recordings and guidance for incorporation of BrainSense™ technology into clinical practice. LFPs can be recorded simultaneously while delivering therapeutic stimulation, inside and outside the clinic. Physicians can correlate the brain signals with stimulation and events capturing medication, symptoms, or side effects to deliver personalized, data-driven treatment and adjust stimulation as patients' needs evolve.

Years of published literature have helped to set a foundation for brain sensing and the use of LFPs as a control signal for closed-loop stimulation (i.e., aDBS) in Parkinson's disease.

The Percept™ PC and Percept™ RC neurostimulators with BrainSense™ technology capture brain signals (i.e., LFPs) using an implanted DBS lead(s). BrainSense™ aDBS, uses this data to automatically increase or decrease stimulation when a patient's brain signal (i.e., alpha or beta LFP power) is high or low (outside of a clinician-defined range), respectively. These adjustments aim to tailor stimulation amplitude to the patient's needs throughout the day.

Single and dual-threshold BrainSense™ aDBS algorithms have been tested in a pivotal trial. The final section of this resource provides an overview of the ADAPT-PD trial and associated outcomes.

Limitations

This scientific compilation of published literature is provided for general educational purposes only and should not be considered the exclusive source for this type of information. The articles address common questions and research concepts in the field of brain sensing research.

While brain signals are becoming better characterized and understood, these articles should be appreciated as scientific research with several limitations:

- The articles may be helpful for navigating through the science of brain sensing and aDBS. There is still much to learn regarding the optimal signal of interest to drive adaptive, closed-loop therapies and most effective algorithms for varying disease states and symptomology.
- Interpretation of early aDBS feasibility studies are often limited due to short-term, in-clinic, externalized testing or small sample sizes.
- Articles were selected as fair and balanced examples of "state of the art" for sensing and aDBS research. This document does not represent an exhaustive list of aDBS literature.
- Physicians should use their own clinical judgement when implementing the use of BrainSense™ technology and deciding how to treat patients with DBS therapy.
- The BrainSense™ features have several limitations themselves:
  - BrainSense™ aDBS is limited to two modes or algorithms (i.e., Single Threshold and Dual Threshold) and to control signals within the alpha-beta frequency range (8-30 Hz).
  - Sensing and stimulation contacts are restricted to predefined combinations; in order to sense, stimulation is limited to the middle contacts. Segmented contacts and surgical planning may help work around this limitation.[2]
  - Cardiac artifact, if present, overlaps with the beta frequency range.[2] Implant location (ie, right side)[2] and leads developed for sensing, such as the SenSight™ lead help reduce artifact noise.
  - Timeline recordings are restricted to a narrow band around a predefined frequency and could miss frequency shifts or the appearance of new bands.[1,2]
  - LFP signals related to a rapidly-occurring event (ie, a fall or freezing of gait) may be difficult to capture due to the delay between the event occurrence and marking with the patient programmer.[2]
  - High frequency oscillations, which may also carry information content regarding patient disease state or treatment, are beyond the recording capabilities of the device.[1]

Disclaimers

- Some of the articles describe acute postoperative research investigating aDBS with externalized leads. These scientific findings may or may not be applicable to the utilization of sensing with chronically implanted systems; short-term,
  in-clinic LFP recording with externalized leads is not common clinical practice and is not endorsed by Medtronic.
- BrainSense™ aDBS and research summarized in this document are for Parkinson's disease indication only. Signals may not be present in all patients.

1. Jimenez-Shahed J. Device profile of the percept PC deep brain stimulation system for the treatment of Parkinson's disease and related disorders. *Expert Rev Med Devices*. 2021 Apr;18(4):319-332.
2. Thenaisie Y, Palmisano C, Canessa A, et al. Towards adaptive deep brain stimulation: clinical and technical notes on a novel commercial device for chronic brain sensing. *J Neural Eng*. 2021 Aug 31;18(4).

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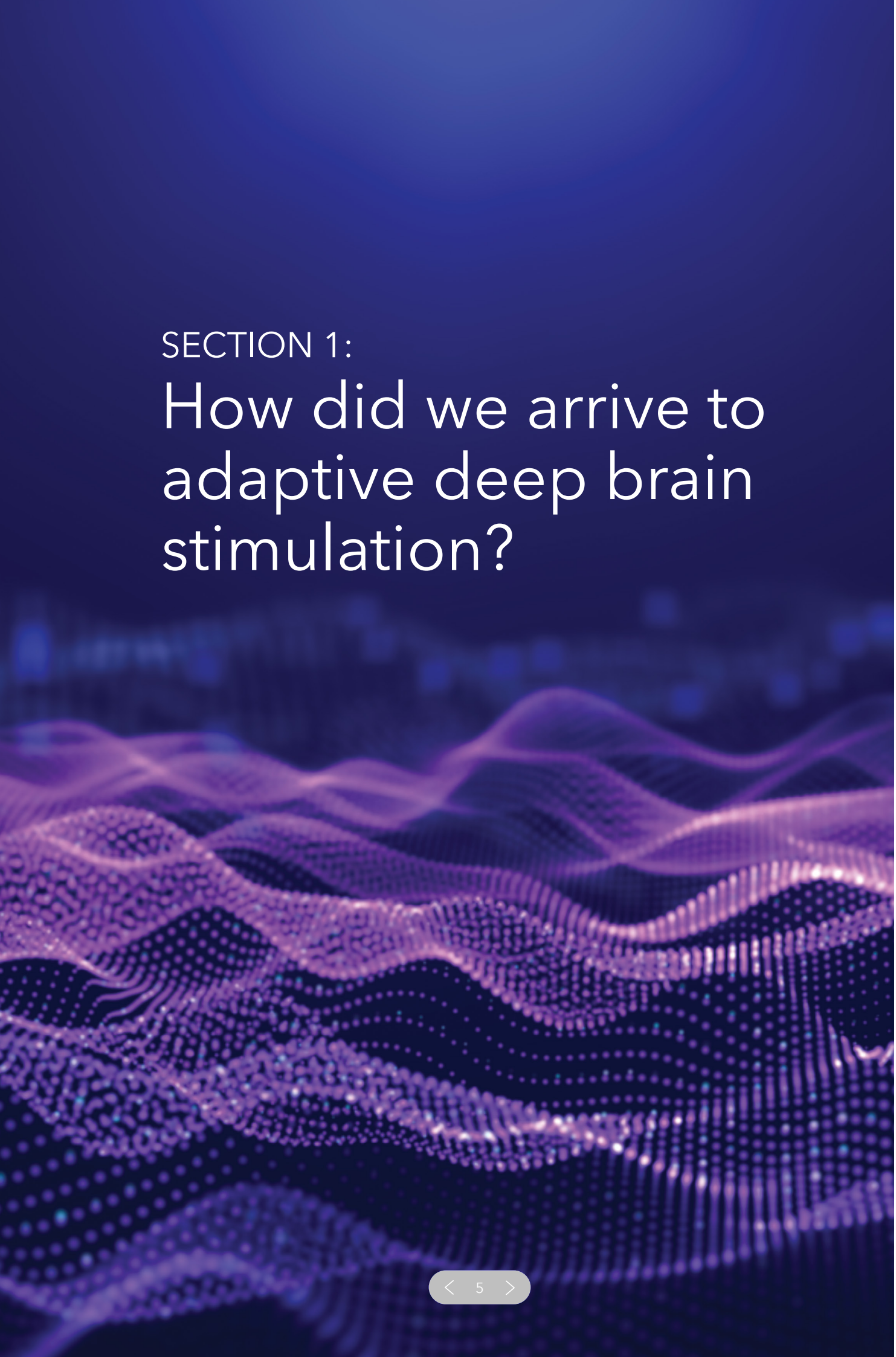


SECTION 1:

How did we arrive to adaptive deep brain stimulation?

A framework for Sensing-Enabled Deep Brain Stimulation: From sensing to adaptive deep brain stimulation (aDBS)

BrainSense™ technology: Trust, Select, Optimize and Maximize LFP Signals

The realization of sensing-enabled DBS, powered by BrainSense™ technology, relies on trust of the signal of interest's relevance to a specific context of use. BrainSense™ technology equips clinicians with tools to identify relevant LFP measures, including the ability to sense biomarkers of bradykinesia and rigidity in patients with PD.† This utility offers valuable and objective data to inform clinical-decision making. First, the detection of LFP peaks can contribute information for contact selection. Next, new and existing programming parameters may be optimized by examining LFP responses to stimulation. Finally, LFP monitoring features of BrainSense™ technology enables clinicians to adjust therapy through personalized insights.

Ultimately, the combined features of LFP characteristics and BrainSense™ technology capabilities provide the ability to adapt deep brain stimulation e.g., (aDBS) in response to patient-specific neurophysiology.

Select
(Contacts)

BrainSense™ Electrode Identifier

Personalized and focused mapping of alpha-beta activity in real-time to provide insights into "sweet spot" proximity

BrainSense™ Electrode Survey

Provides decision-making support to select a contact or directionally shift stimulation in monopolar review or follow up programming

Optimize
(Therapy configurations)

BrainSense™ Streaming

- Identify stimulation-related therapeutic window
- Adjust stimulation parameters to address potentially suboptimal therapy configurations

BrainSense™ Thresholds

Assess the time spent with or without symptoms when outside the clinic

Maximize‡
(Therapeutic results)

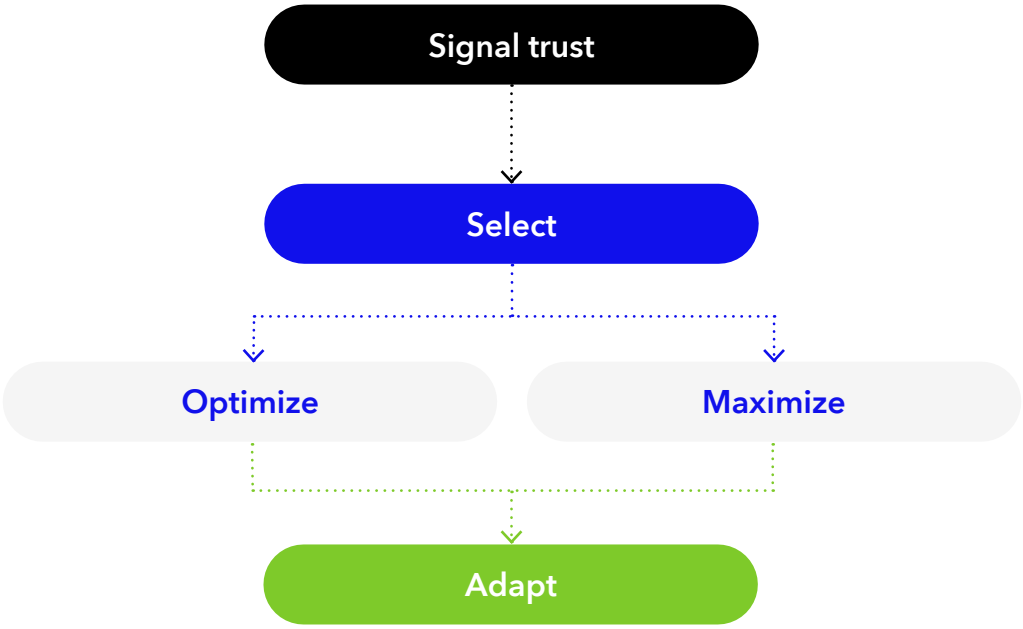
BrainSense™ aDBS

aDBS offers personalized, automatic stimulation amplitude adjustments in response to patient-specific neurophysiology

† Biomarker in this context refers to local field potentials from the subthalamic nucleus in the alpha-beta frequency range which correlate to bradykinesia and rigidity symptoms in patients with Parkinson's disease.

‡ Improved motor symptom control results were based on post hoc analysis averaging overall patient aDBS on time results compared to cDBS. Results presented for dual threshold aDBS. N=40. Based on results from an open-label comparison.

Sensing-enabled DBS framework



The BrainSense™ suite of tools offers decision-making support to **select** and **optimize** programming configurations and **maximize** therapeutic results.†

Building upon LFP signal trust (e.g., LFP peak detection, stability, association to clinical state or subcortical anatomy), the data collected through BrainSense™ technology provides clinicians with decision-making support throughout a patient's journey with DBS.

†Improved motor symptom control results were based on post hoc analysis averaging overall patient aDBS on time results compared to cDBS. Results presented for dual threshold aDBS. N=40. Based on results from an open-label comparison.

Local field potential characteristics conducive to support adaptive deep brain stimulation in patients with Parkinson's disease

Local field potential peaks are detectable in the majority of patients with PD and primarily fall within the alpha-beta range.

LFP peak and band power measures are correlated with Parkinsonian symptom states (e.g., UPDRS-III total score and bradykinesia/rigidity subscores).

Beta power is suppressed by dopaminergic medications and DBS and can fluctuate with circadian rhythm. The magnitude of power suppression can reflect therapeutic responses to therapy.

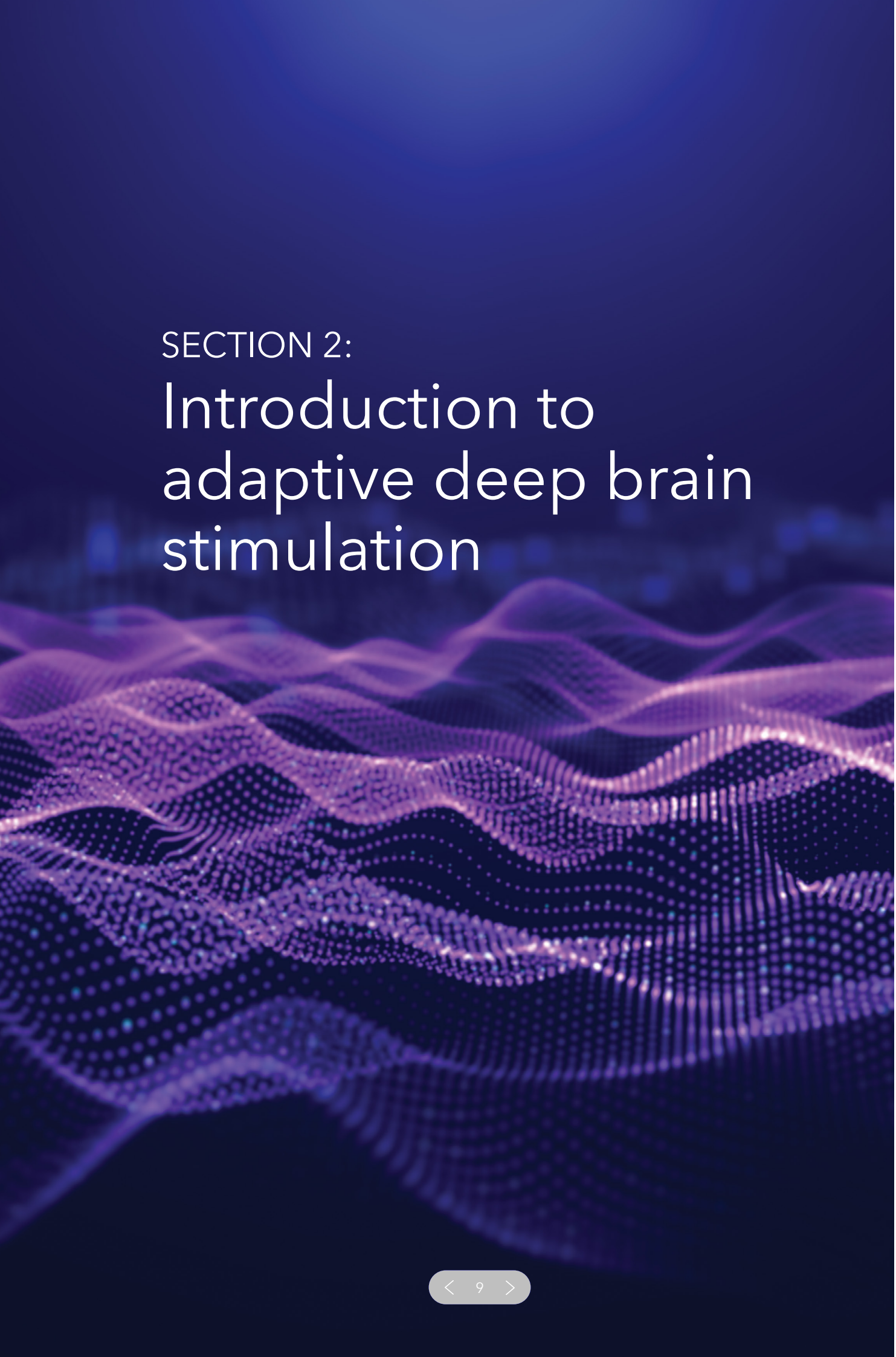
Over the past decade, extensive research on local field potentials (LFP) from the subthalamic nucleus (STN) and globus pallidus internus (GPi) in patients with Parkinson's disease (PD) has revealed the diverse applications of these signals in gaining insights into pathophysiology and their potential clinical applications.[1] One key finding from LFP research in PD is the role of beta band (13-30 Hz) hyper-oscillatory activity in the clinical manifestation of motor impairments, principally bradykinesia and rigidity.[2,3] This hyper-oscillatory activity, manifesting as a LFP peak, is present in the majority of patients with PD.[4] Additionally, the response of beta measures to antiparkinsonian medication and DBS is noteworthy; elevated beta activity typically diminishes with treatment, leading to subsequent improvements in UPDRS-III scores.[4] Taken together, these findings provide substantive evidence to support a closed-loop, adaptive, DBS system based on patient STN and GPi LFP data.

1. Yin Z, Zhu G, Zhao B, et al. Local field potentials in Parkinson's disease: A frequency-based review. *Neurobiology of Disease*. 2021;155:105372.

2. Morelli N, Summers RLS. Association of subthalamic beta frequency sub-bands to symptom severity in patients with Parkinson's disease: A systematic review. *Parkinsonism & Related Disorders*. 2023;110.

3. van Wijk BCM, de Bie RMA, Beudel M. A systematic review of local field potential physiomarkers in Parkinson's disease: from clinical correlations to adaptive deep brain stimulation algorithms. *Journal of Neurology*. 2023;270(2):1162-1177.

4. Darcy N, Lofredi R, Al-Fatly B, et al. Spectral and spatial distribution of subthalamic beta peak activity in Parkinson's disease patients. *Experimental Neurology*. 2022:114150.



SECTION 2:

Introduction to adaptive deep brain stimulation

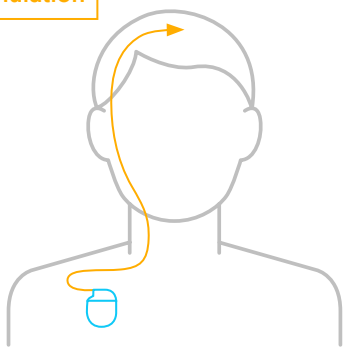
What is adaptive deep brain stimulation?

BrainSense™ technology's capacity to record local field potentials (LFP) provides opportunities to personalize DBS in a closed-loop, or adaptive (aDBS), system of therapy delivery. Given the association of alpha-beta power to medication and motor states, aDBS automatically adjusts stimulation in response to fluctuations of alpha-beta power.

Tonic Stimulation

Continuous DBS

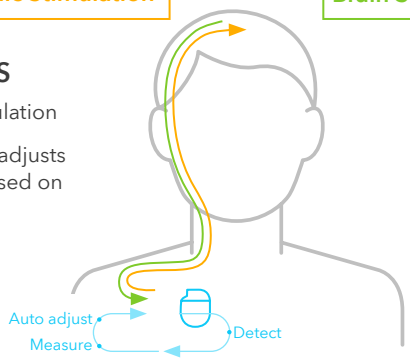
- Tonic stimulation
- Stimulation parameters adjusted manually by physician



Dynamic Stimulation **Brain Signals**

Adaptive DBS

- Dynamic stimulation
- Automatically adjusts stimulation based on brain signals



Why aDBS?

Continuous or classic DBS systems were not designed to respond to changes in patient state or medication regimen, ultimately requiring the patient or caregiver to manually adjust stimulation amplitude throughout the day to optimize symptom control.

Adaptive deep brain stimulation (aDBS) was developed to automatically adjust DBS amplitude in response to fluctuation in neural activity or behavior, in order to provide more stable symptom control, reduce side effects, and maximize neurostimulator battery longevity.[1-4]

1. Little S, Pogosyan A, Neal S, et al. Adaptive deep brain stimulation in advanced Parkinson disease. *Ann Neurol* 2013;74(3):449–57.
2. Little S, Tripoliti E, Beudel M, et al. Adaptive deep brain stimulation for Parkinson's disease demonstrates reduced speech side effects compared to conventional stimulation in the acute setting. *J Neurol Neurosurg Psychiatry* 2016;87(12):1388–9.
3. Rosa M, Arlotti M, Marceglia S, et al. Adaptive deep brain stimulation controls levodopa-induced side effects in Parkinsonian patients. *Mov Disord* 2017;32(4):628–9.
4. Pina-Fuentes D, Dijk JMC van, Zijl JC van, et al. Acute effects of adaptive Deep Brain Stimulation in Parkinson's disease. *Brain Stimul* 2020;13(6):1507–16.

Introduction to aDBS Modes

Two aDBS modes are available for use with Percept™ PC and Percept™ RC, including Single Threshold and Dual Threshold.

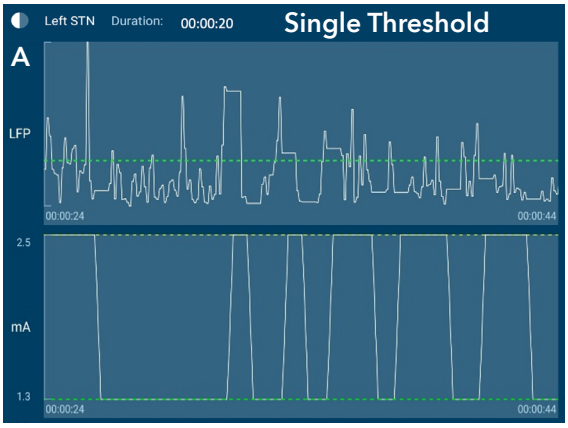
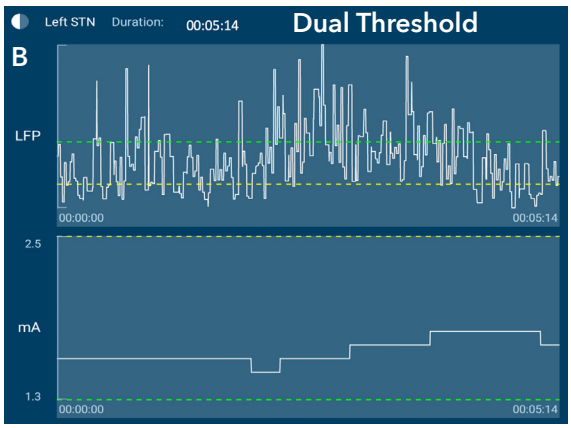
Mode	Single Threshold	Dual Threshold
Function	Single Threshold mode rapidly (milliseconds) adjusts stimulation amplitude between lower and upper limits within 250 milliseconds based on LFP power. Single threshold aDBS is designed to rapidly respond to long duration and high amplitude alpha-beta LFP power, which are associated with PD symptom states, while allowing for short elevations in alpha-beta LFP power associated with normal physiologic function.	Dual Threshold mode slowly (minutes) adjusts stimulation amplitude based on changes in LFP power, taking 2.5 minutes to increase and 5 minutes to decrease the amplitude. Dual threshold aDBS aims to provide more consistent symptom management by automatically adjusting stimulation amplitude in response to alpha-beta power fluctuations that may be caused by medication or daily activities.
Tablet view	 20 seconds	 ~5 minutes

Image adapted from Stanslaski et al. 2024. https://doi.org/10.1038/s41531-024-00772-5.

SECTION 3:

Adaptive deep brain stimulation feasibility research

Adaptive deep brain stimulation feasibility research

Technological advancements in LFP sensing have made it possible to personalize stimulation through adaptive deep brain stimulation (aDBS) for patients with Parkinson's disease (PD). As such, several small safety and feasibility studies have explored the use of aDBS to address a number of cardinal motor symptoms of PD.[†] These early studies, leveraging alpha-beta control signals, have found bradykinetic and tremor symptoms are responsive to aDBS, potentially alongside reduced stimulation time and total electrical energy delivery compared to traditional continuous DBS.[†] Together, these data highlighted the early feasibility of implementing aDBS in patients with PD.

Summary of aDBS feasibility studies

Clinical implications

- Feasible
- Safe
- Less total electrical energy delivery

Limitations

- Short-term exposure
- No studies for GPi or with directional stimulation
- One mode of aDBS at a time, no directional aDBS
- Limited to in-clinic and acute studies with few reports of real-world or chronic performance

[†]Prior aDBS Publications

- Little, S., Pogosyan, A., Neal, S., Zavala, B., Zrinzo, L., Hariz, M., et al. (2013). Adaptive deep brain stimulation in advanced Parkinson disease. Ann. *Neurol*. 74, 449–457.
- Tinkhauser G, Pogosyan A, Little S, Beudel M, Herz DM, Tan H, et al. The modulatory effect of adaptive deep brain stimulation on beta bursts in Parkinson's disease. *Brain*. 2017; 140:1053–67.
- Little S, Beudel M, Zrinzo L, et al. Bilateral adaptive deep brain stimulation is effective in Parkinson's disease. *Journal of Neurology, Neurosurgery & Psychiatry*. 2016;87(7):717
- Piña-Fuentes D, van Dijk JMC, van Zijl JC, et al. Acute effects of adaptive Deep Brain Stimulation in Parkinson's disease. *Brain Stimul*. 2020;13(6):1507-1516
- Nakajima A, Shimo Y, Fuse A, et al. Case Report: Chronic Adaptive Deep Brain Stimulation Personalizing Therapy Based on Parkinsonian State. *Front Hum Neurosci*. 2021;15:702961.
- Velisar A, Syrkin-Nikolau J, Blumenfeld Z, et al. Dual threshold neural closed loop deep brain stimulation in Parkinson disease patients. *Brain Stimul*. 2019;12(4):868-876

SECTION 4:

ADAPT-PD trial overview

Background and objectives

- The culmination of aDBS studies in PD indicate that aDBS may provide an effective therapy and energy savings compared to cDBS. However, these studies† were predominantly of small sample size and consisted of short bedside evaluation, only tested one mode of aDBS (i.e., single or dual threshold), and mainly focus on one target for DBS (i.e., the STN).
- While the feasibility of aDBS in a naturalistic environment has been demonstrated,[1] aDBS had not yet been validated as safe and effective.
- The ADAPT-PD clinical trial was designed to address these gaps in understanding and make the adaptive feature clinically available.

Methods

Study design

- Multicenter, prospective, randomized single-blind crossover (between dual and single threshold modes of aDBS) with open-label comparison between aDBS and cDBS. All patients were implanted with Medtronic Percept™ PC.

Study purpose

- To demonstrate the safety and effectiveness of chronic dual and single threshold aDBS in patients with PD.

Notable inclusion criteria

- Stable STN or GPi DBS and medication therapy for PD.
- Patient with moderate to advanced PD and who is responsive to DBS.
- LFP peak power amplitude ≥1.2 µVp in the alpha-beta band on left and/or right DBS leads. (This peak amplitude is recommended for aDBS.)

† Studies listed on page 13 as Prior aDBS publications

1. Oehrn, C.R., Cernera, S., Hammer, L.H. et al. Chronic adaptive deep brain stimulation versus conventional stimulation in Parkinson's disease: a blinded randomized feasibility trial. Nat Med 30, 3345–3356 (2024).

ADAPT-PD study design

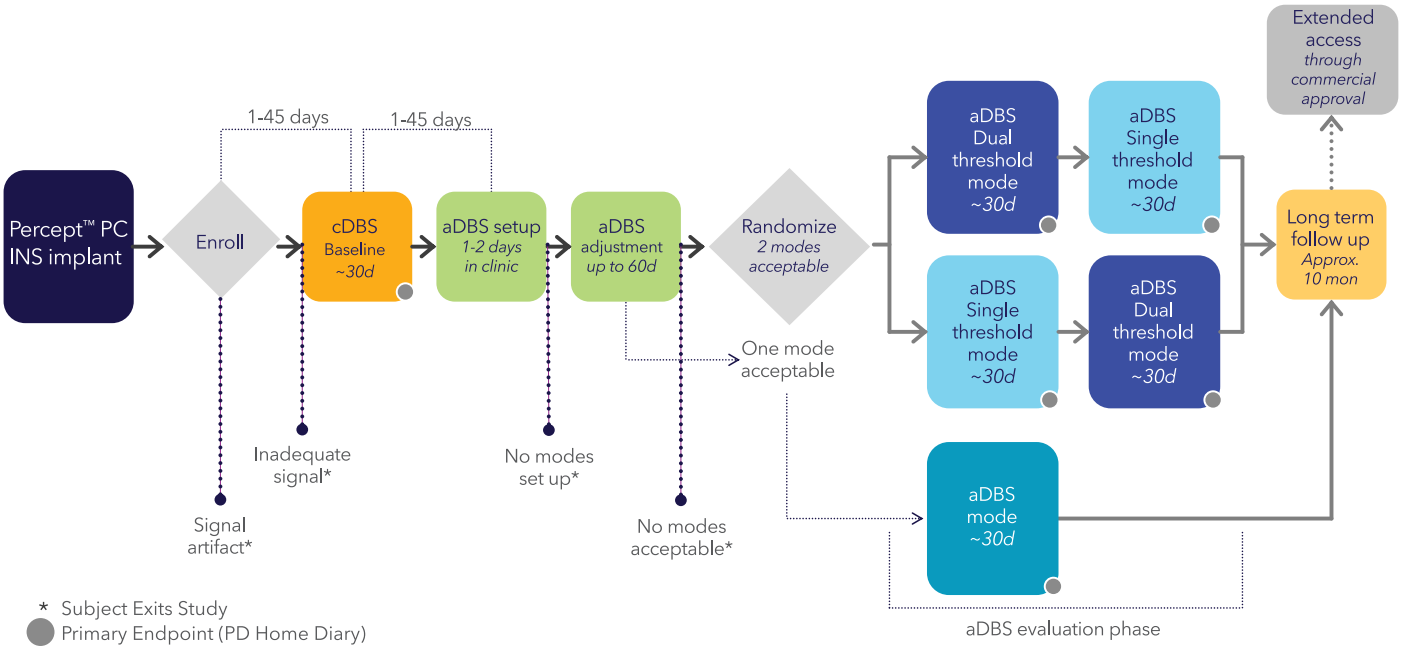


Figure from the ADAPT-PD methodology publication: Stanslaski, S., Summers, R.L.S., Tonder, L. et al. Sensing data and methodology from the Adaptive DBS Algorithm for Personalized Therapy in Parkinson's Disease (ADAPT-PD) clinical trial. npj Parkinsons Dis. 10, 174 (2024). Licensed under CC BY 4.0: https://creativecommons.org/licenses/by/4.0/

ADAPT-PD study phases

1. **cDBS baseline phase (gold):** 30-day evaluation on stable cDBS settings
2. **aDBS setup and adjustment phase (green):** up to 60-day programming on both modes
3. **aDBS evaluation phase (blue):** 30-day evaluation in one or both aDBS modes (if both deemed acceptable)
4. **Long-term follow-up phase (yellow):** ~10 months of aDBS in the mode selected by the patient

Primary objective

To meet the primary objective, at least 50% of participants were to meet a success criteria endpoint: no worse than -2 hours less "On" time without troublesome dyskinesia during aDBS evaluation compared to their stable cDBS evaluation, for each aDBS mode. "On" time was based on a self-reported motor diary completed by participants every 30 minutes over 24 hours on at least 3 consecutive days prior to the evaluation visit.

Secondary endpoint: energy delivered

To demonstrate reduced total electrical energy delivered (TEED) during aDBS compared to cDBS.

Safety and additional objectives

Stimulation-related AEs, AEs, and device deficiencies. Wearable device data, Voice Handicap Index, MDS-UPDRS, EQ-5D-5L, PDSS-2, PDQ-39, and patient preference and satisfaction.

For more details regarding ADAPT-PD methodology and full endpoint descriptions, please see the published protocol: Stanslaski S, Summers RLS, Tonder L, et al; ADAPT-PD Investigators. Sensing data and methodology from the Adaptive DBS Algorithm for Personalized Therapy in Parkinson's Disease (ADAPT-PD) clinical trial. NPJ Parkinsons Dis. 2024;10(1):174.

Results*

Participants

68 participants enrolled in the primary cohort of the trial, receiving non-directional stimulation from legacy leads, or from SenSight™ leads set to ring mode. 17 additional participants enrolled in the directional cohort, receiving directional stimulation from SenSight™ leads. Here results from this primary cohort are presented.

Baseline characteristics of study population

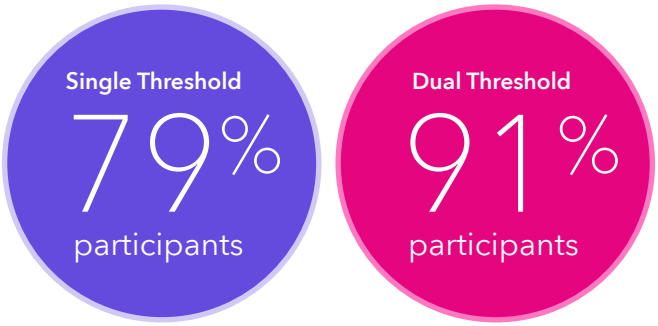
Characteristic	Mean ± standard deviation
Age - yr (n = 66) (range)	62.2 ± 8.4 (36-75)
PD duration - yr (n = 64)	13.5 ± 6.8
Dyskinesia - yr (n = 37)	6.9 ± 4.8
Motor fluctuations - yr (n = 46)	7.6 ± 4.6
Duration of levodopa treatment – yr (n = 60)	10.7 ± 6.1
Levodopa equivalent daily dose - mg	561.9 ± 568.3
Sex - no. (%)	
Male	48 (70.6%)
Female	20 (29.4%)
Target site by participant - no. (%)	
STN	51 (75.0%)
GPi	17 (25.0%)
Years from the lead implant to consent	3.4 ± 3.3
MDS-UPDRS part III (Off stim/Off meds) (n = 58)	45.7 (14.9)
Tremor	8.8 (6.4)
Rigidity	8.3 (3.6)
Bradykinesia	22.9 (8.3)
Axial	5.6 (3.0)

Primary Cohort Consented N = 68. On and off medication examination completed at enrollment and screening visits.

Primary objective met

The majority of patients met the success criteria. Dual Threshold aDBS proportion of success was 91% (N = 40); and Single Threshold aDBS proportion of success was 79% (N = 35).

Primary endpoint success criteria: no worse than -2 hour loss of "On" time without troublesome dyskinesia during aDBS relative to cDBS

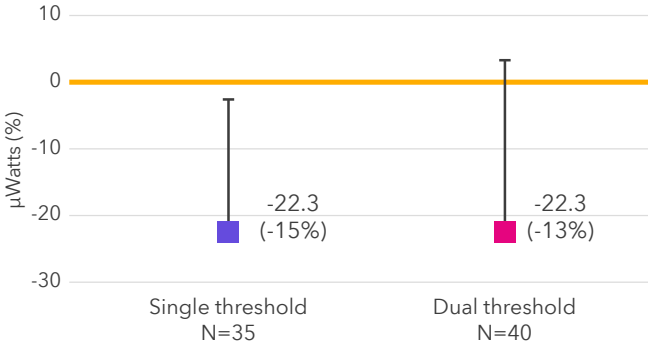


aDBS impact on energy and battery

Secondary objective met: Total electrical energy delivered (TEED)

Total energy delivered aDBS demonstrated a mean decrease of 22.3 (SE: 8.37) µWatts during Single Threshold aDBS and 22.3 (SE: 10.98) µWatts during Dual Threshold aDBS.

Change in TEED



* The results presented in this compendium come from :

- Bronte-Stewart HM, Beudel M, Ostrem JL, et al. Long-Term Personalized Adaptive Deep Brain Stimulation in Parkinson Disease: A Nonrandomized Clinical Trial. JAMA Neurol. Published online September 22, 2025. doi:10.1001/jamaneurol.2025.2781

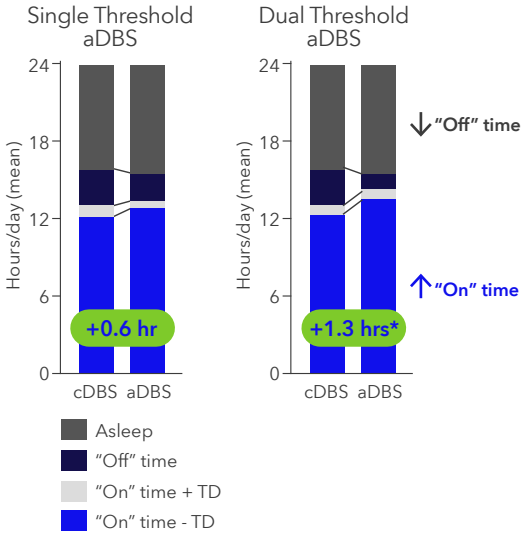
- Chronic adaptive DBS provides similar "On" time with trend of improvement compared to continuous DBS in Parkinson's disease and 98% of subjects chose to remain on aDBS. AAN podium presentation 2024

Exploratory motor diary data

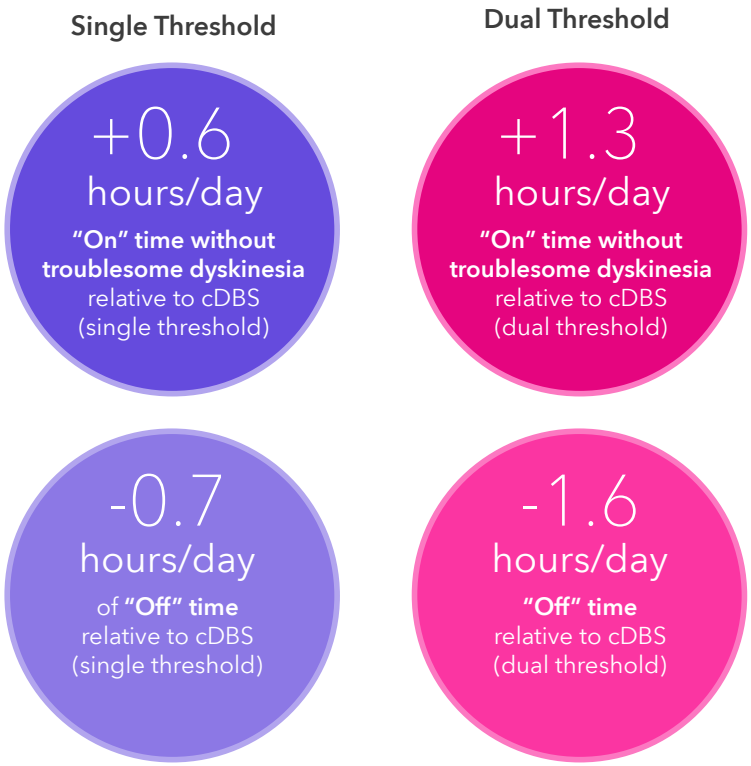
Changes in motor diary:

Dual Threshold (N = 40) aDBS resulted in a clinically meaningful improvement in "On" time without troublesome dyskinesia (+1.3 hrs/day) and reduced Off time (-1.6 hrs/day) compared to cDBS.[1,2] Single Threshold aDBS demonstrated a modest increase in "On" time without troublesome dyskinesia (+0.6 hrs/day) and reduction in Off time (-0.7 hrs/day).

Change in motor diary

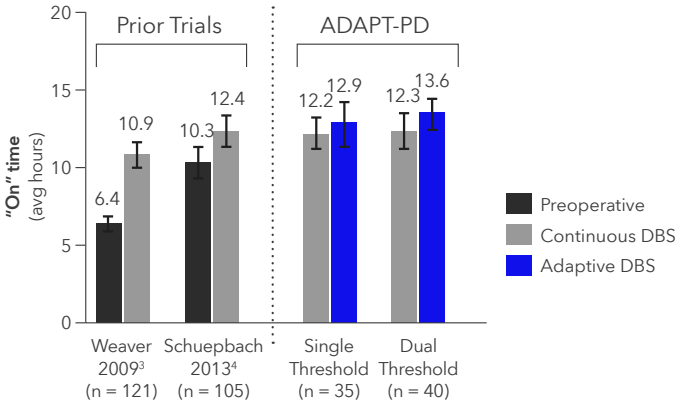


Motor diary data at baseline continuous deep brain stimulation (cDBS) and adaptive deep brain stimulation (aDBS). Change in "On" time listed by hour change from baseline for group average. Note*: changes > 1 hour are clinically meaningful.[1,2] TD = troublesome dyskinesia

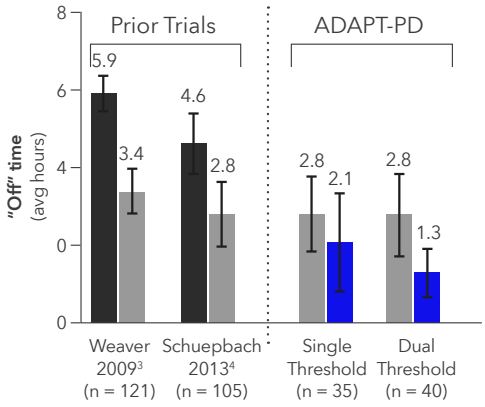


Historical DBS "On" and "Off" time compared to ADAPT-PD study cohort. Average "On" and "Off" time after therapeutic intervention extracted from two prior studies establishing the effectiveness of cDBS for Parkinson's disease and in the ADAPT-PD trial. Note: Weaver et al., 2009 (N = 121) and Schuepbach et al, 2013 (N = 105) compared best medical therapy to cDBS at 6 months and 24 months follow-up postoperative, respectively.

"On" Time without troublesome dyskinesia



"Off" Time



"Average On and Off time were based on entries in patient diaries, recorded every 30 minutes on 2 consecutive days for Weaver et al. 2009 study and on 3 consecutive days for Schuepbach et al. 2013 and ADAPT-PD studies."

1. Hauser RA, Auinger P, Group on behalf of the PS. Determination of minimal clinically important change in early and advanced Parkinson's disease. *Mov Disord* (2011) 26:813–818. doi:
2. Papapetropoulos S (Spyros). Patient Diaries As a Clinical Endpoint in Parkinson's Disease Clinical Trials. *CNS Neurosci Ther* (2012) 18:380–387.
3. Weaver FM, Follett K, Stern M, et al. Bilateral deep brain stimulation vs best medical therapy for patients with advanced Parkinson disease: a randomized controlled trial. *JAMA*. 2009;301(1):63-73.
4. Schuepbach WM, Rau J, Knudsen K, et al. Neurostimulation for Parkinson's disease with early motor complications. *N Engl J Med*. 2013;368(7):610-622.

Safety

- As with cDBS, stimulation-related adverse events are expected during initial aDBS setup.
- All but one stimulation-related AEs resolved with reprogramming in the aDBS setup and adjustment phase (insomnia).
- Similar safety profiles between single and dual threshold.

Stimulation-related adverse events occurred at a higher rate during aDBS Set-up and Adjustment Phase, with events largely categorized as worsening of PD symptoms (n = 12, 22.6% of patients) and dyskinesias (n = 13, 24.55% of patients) as would be expected when modifying DBS settings.

aDBS Evaluation Phase

Stimulation-related AEs during the aDBS Evaluation Phase are presented below. All stimulation-related events were resolved during the aDBS evaluation phase. Additionally, no unexpected serious or adverse device events were reported, and no subject deaths were reported. Overall, the safety profile observed in this study for aDBS is consistent with those described in cDBS.

aDBS Evaluation Phase AEs		
aDBS Mode		
Stimulation-related AEs 17 events (13 subjects/45) None serious	**Single Threshold (N = 35)** 11 events (8 [22.9%] subjects) None serious	**Dual Threshold (N = 40)** 6 events (5 [12.5%] subjects) None serious

aDBS Setup and adjustment phase

All but one stimulation-related adverse event resolved with reprogramming.

Enrollment through long-term follow-up

No serious adverse device events (N = 44)

Patient satisfaction and preference

Patients would recommend aDBS, were satisfied with therapy, and preferred to continue with aDBS at long-term follow-up.

98%
chose to continue with aDBS into long-term follow-up phase (44/45)

100%
are satisfied with aDBS at the end of long-term follow-up phase (38/38)†

95%
would recommend aDBS to other DBS patients with PD (36/38)†

Common reasons for preferring aDBS

66%
Address symptom fluctuations

63%
Improving motor symptoms

45%
Manage side effects

† Based on patient survey taken at the end of long-term follow-up (LTF). 40/44 patients completed LTF; 4 patients discontinued (3 = reverted to cDBS, 1 = withdrew). n = 2 missing data at end of LTF.

Key takeaways

Summary of findings

aDBS is effective relative to cDBS as an optional programming feature, while delivering less energy.†

+1.3
hours/day
"On" time without troublesome dyskinesia relative to cDBS (dual threshold)

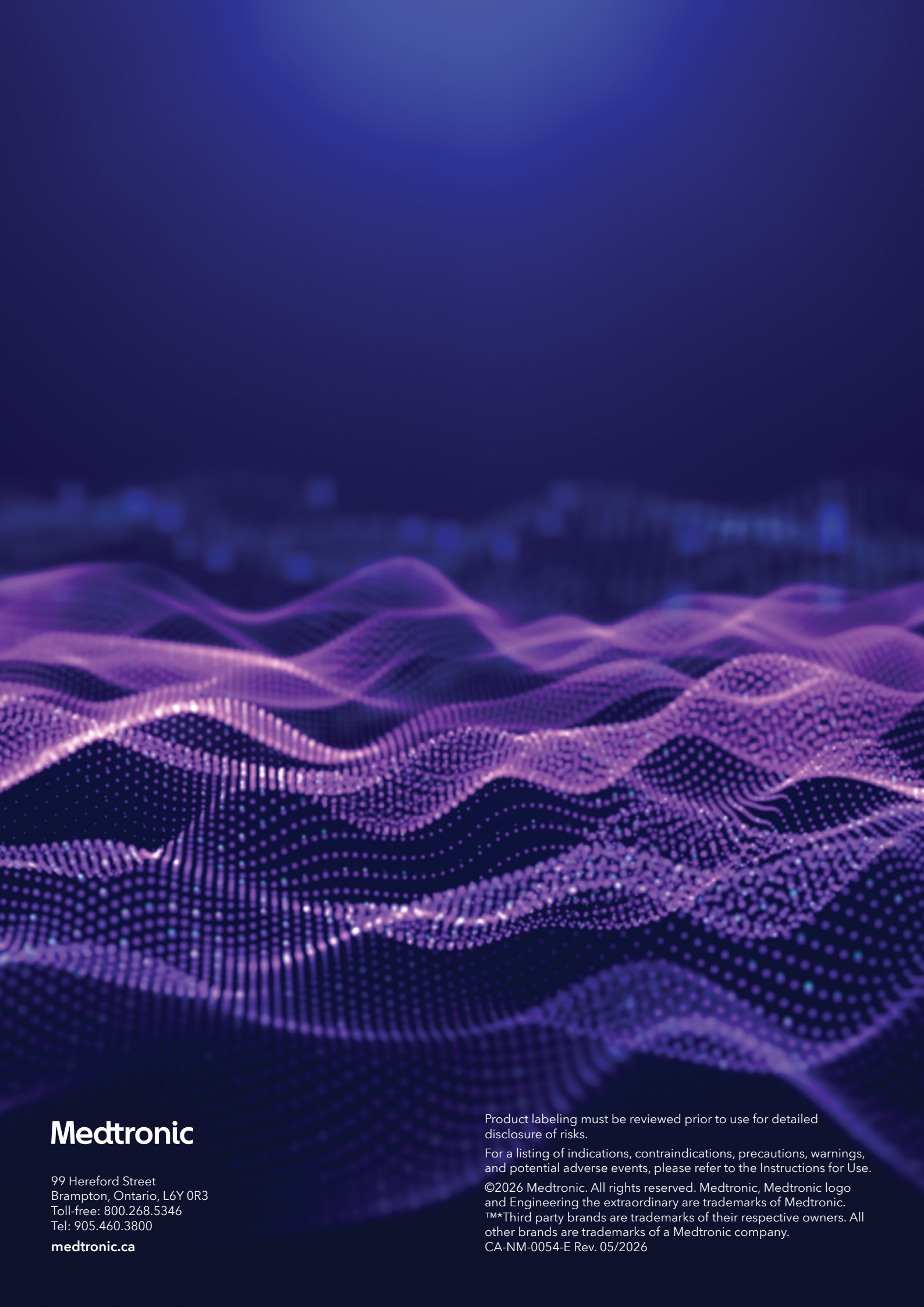
-1.6
hours/day
"Off" time relative to cDBS (dual threshold)

98% & 95%
(44/45) (36/38)
of participants chose to **remain on aDBS** and **would recommend aDBS** to other DBS patients, respectively

0
SADEs
(serious adverse device events)
There were no **SADEs through long-term follow-up‡**
n = 44

† Single Threshold aDBS mode only.

‡ ~10 months aDBS in the mode selected by the patient



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Product labeling must be reviewed prior to use for detailed disclosure of risks.

For a listing of indications, contraindications, precautions, warnings, and potential adverse events, please refer to the Instructions for Use.

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