

CASE REPORT: Reversal of Chronic Autonomic Dysfunction with Transcutaneous Vagus Nerve Stimulation (tVNS) as Part of a Multi-Faceted Anti-inflammatory Regimen

DR. PATRICK NEMECHEK, D.O. & JEAN NEMECHEK, J.D., NEMECHEK AUTONOMIC MEDICINE, ARIZONA, U.S.A.

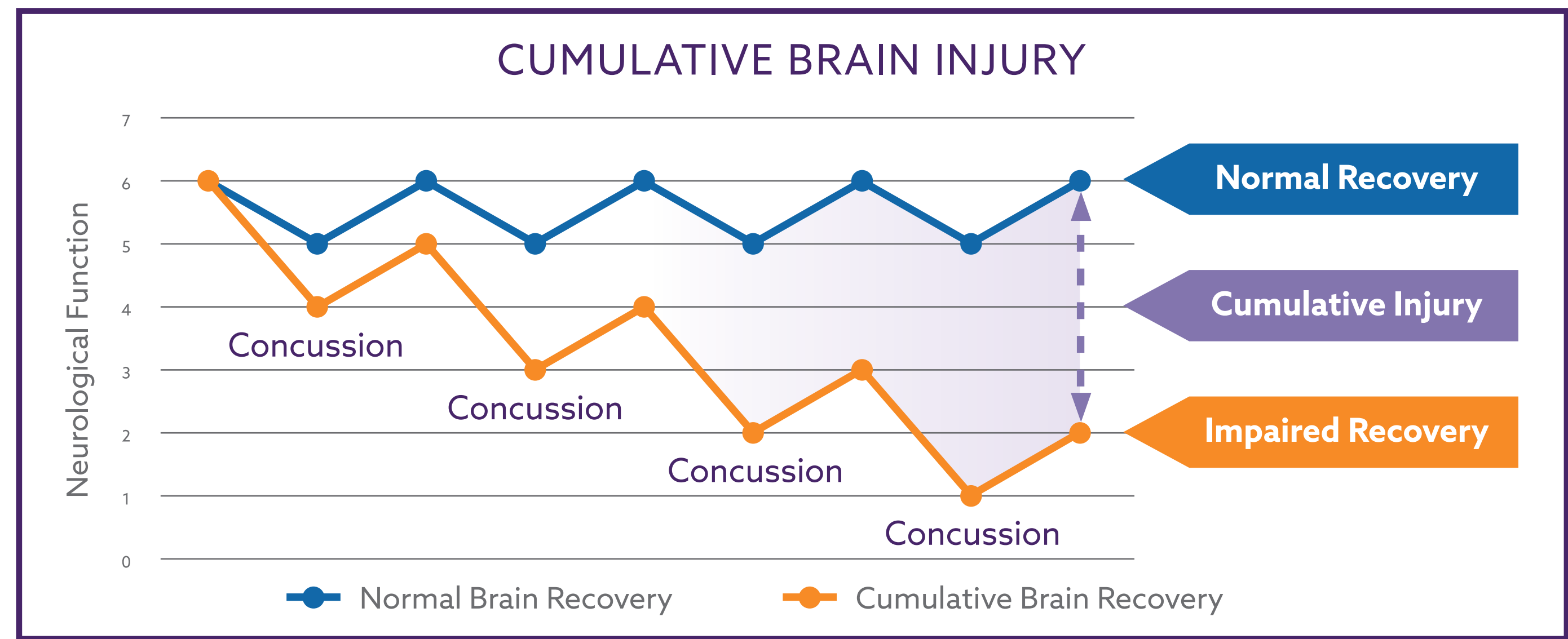
INTRODUCTION

The human brain can repair neuronal damage after injury from a wide variety of common traumas (physical, emotional, inflammatory, and toxic).<sup>1,2</sup>

Traumatic brain injury (TBI) commonly disrupts autonomic function<sup>3,4</sup> and is the source of many TBI-related symptoms (lightheadedness, headaches, anxiety, poor cognition).

The ability to recover from TBI is inconsistent. A TBI in one person results in temporary symptoms that fully resolve within weeks to months while an identical injury in another individual may causes symptom that never fully resolve.

Primed-microglia impair the recovery process<sup>5</sup> and results in a process called cumulative brain injury or CBI.



Recovery of autonomic function at resting and during dynamic testing was demonstrated after 4-6 months of treatment with the Nemechek Protocol.

Significant improvement of heart rate variability (HRV) was noted with increases in the average resting Parasympathetic (RfA) responses ( $\Delta=1.34$  bpm2,  $p=0.05$ ), and average resting Sympathetic (LFa) responses ( $\Delta=2.34$  bpm2,  $P=0.01$ ).

Sympathovagal balance (LFa/RfA) responses increased, but not significantly ( $\Delta=0.95$  bpm2,  $P=0.33$ ).

	Resting	Resting	Sympathovagal	Valsalva	Valsalva	Ortho	Ortho
	LFa	Resting	Balance (LFa/RfA)	LFa	RfA (%)	LFa	RfA (%)
Baseline	2.06	1.90	2.24	43.93	92.89	21.28	71.43
Treated	4.40*	3.24*	3.19	50.41	44.29*	4.87	58.57*

LFa - Sympathetic response, RfA - Parasympathetic response, Ortho - 5-minute stand test \* Indicates P-value is less than 0.05.

Improvements in dynamic autonomic function were observed including a decrease of abnormal, excessive parasympathetic responses during Valsalva (48.6% reduction,  $P=0.01$ ) and during 5-minute postural challenge. (32.9% reduction,  $P=0.01$ ).

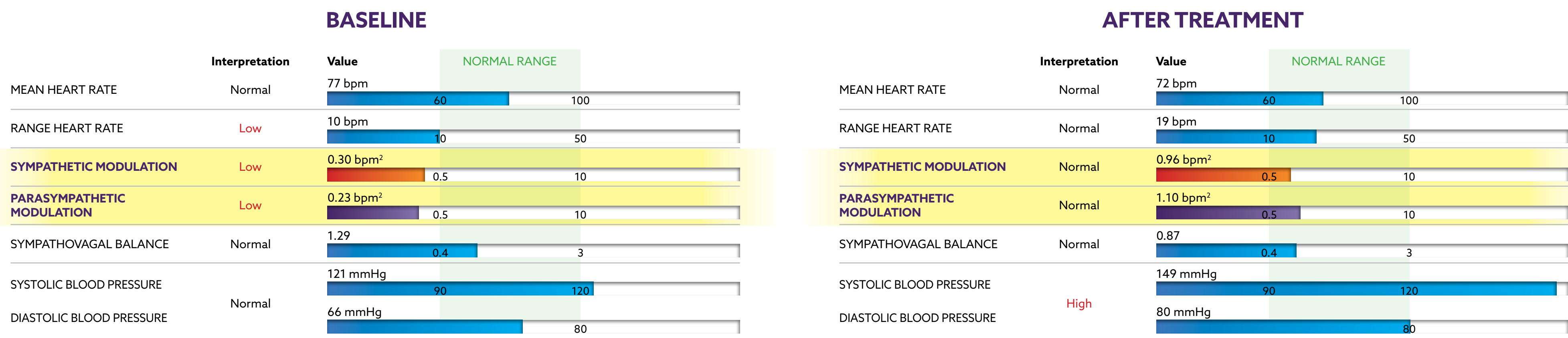
Dynamic sympathetic responses showed non-significant declines with Valsalva ( $\Delta=-2.12$  bpm2,  $P=0.76$ ), and 5-minute postural challenge ( $\Delta=-0.26$  bpm2,  $P=0.63$ ). Improvement in dynamic sympathetic function is commonly obscured with improvements in parasympathetic excess states.

Time domain indices all showed positive trends but failed to meet significance; sdNN ( $\Delta=+40.4$ ,  $P=0.16$ ), rmsDD ( $\Delta=+31.4$ ,  $P=0.14$ ), pNN50 ( $\Delta=+10.7$ ,  $P=0.37$ ).

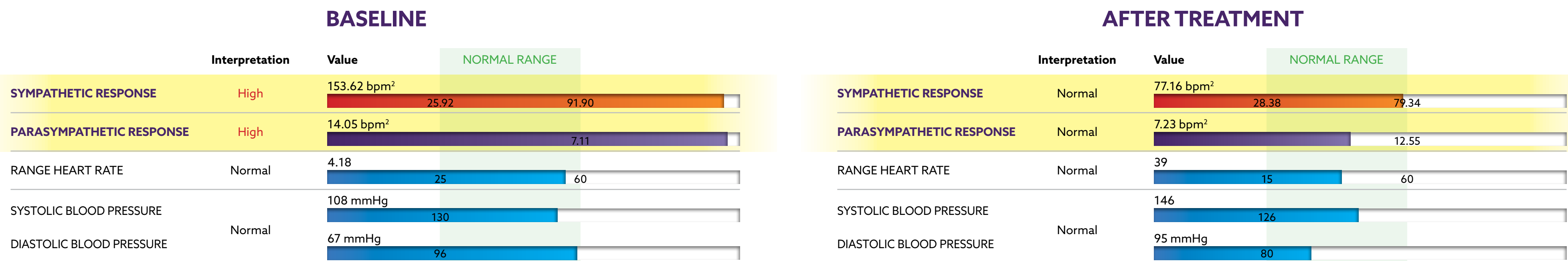
RESULTS

EXAMPLE OF RECOVERY IN A 54-YEAR OLD MALE WITH HISTORY OF mTBI 35-YEARS PRIOR TO TREATMENT

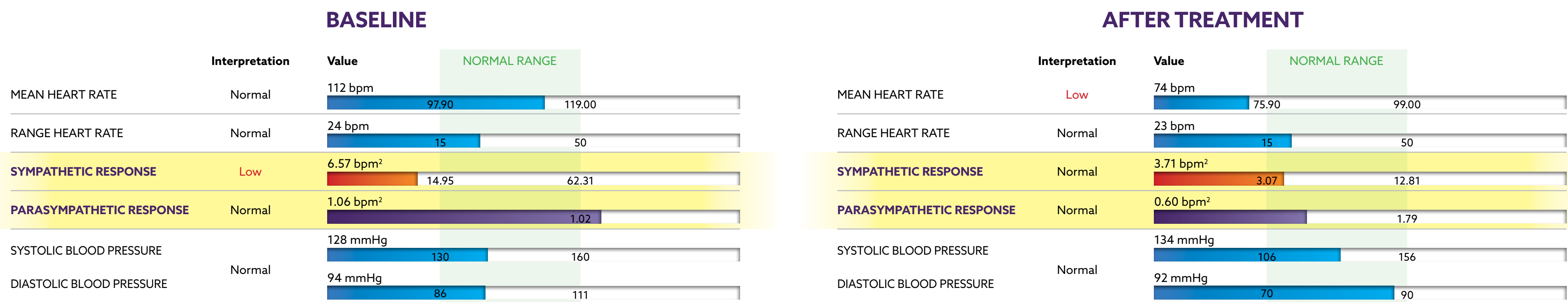
AT REST, 5-MINUTES - RECOVERY OF SYMPATHOVAGAL BALANCE



VALSALVA - RECOVERY OF EXCESSIVE PARASYMPATHETIC AND SYMPATHETIC STATES



5-MINUTE ORTHOSTATIC CHALLENGE - RECOVERY OF EXCESSIVE PARASYMPATHETIC AND DEFICIENT SYMPATHETIC STATES



CONCLUSION

Utilizing transcutaneous vagus nerve stimulation, the Nemechek Protocol reverse chronic autonomic dysfunction within 2-4 months.

Improved resting heart rate variability and dynamic parasympathetic function during Valsalva and 5-minute orthostatic challenged were observed.

Improvement of symptoms such as lightheaded or dizzy sensations, headaches, chronic fatigue, anxiety and poor memory or concentration improved in parallel with autonomic recovery (data not shown).

Complete recovery of ANS function and symptom resolution were often seen in patients after 8-12 months of treatment with the Nemechek Protocol.

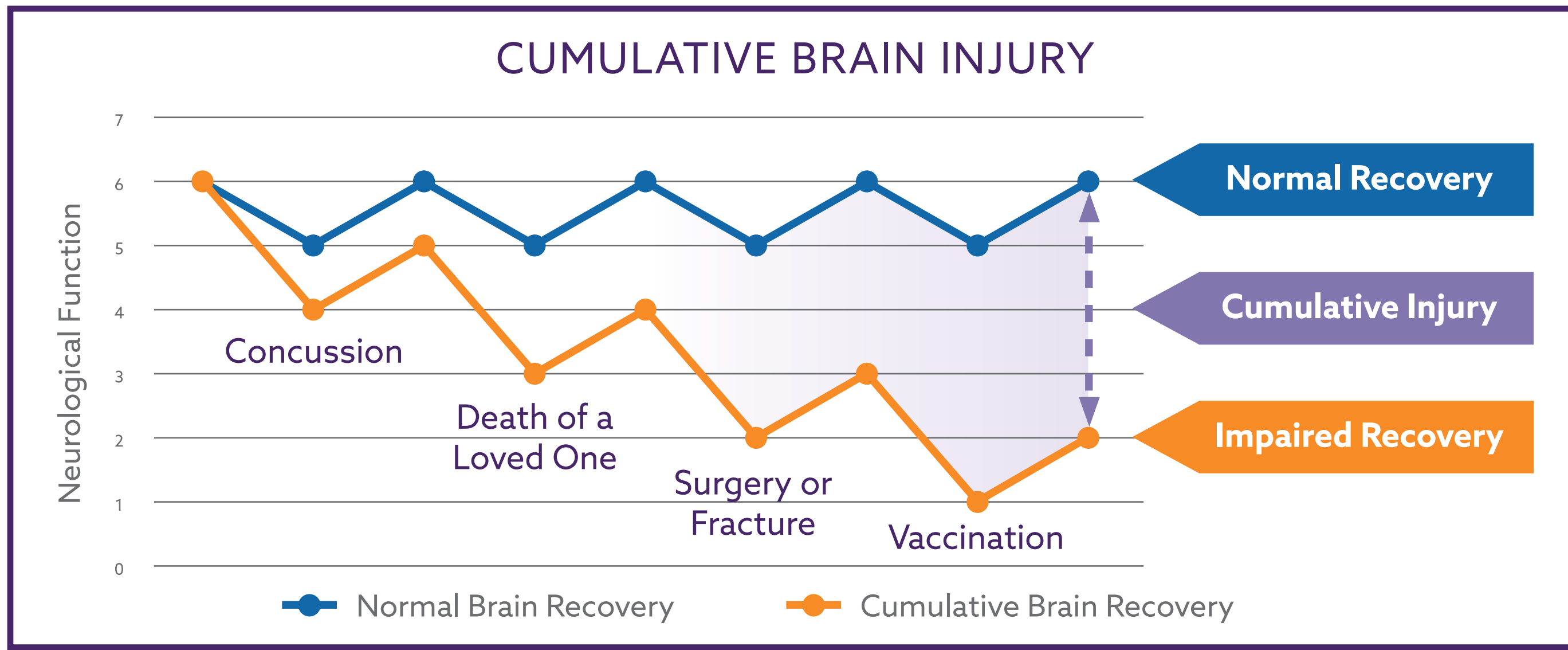
FUTURE CONSIDERATIONS

Brain injury can occur from physical, emotional and inflammatory injuries, and should be repaired within a few weeks to months if normal brain repair mechanisms are functioning.<sup>1,2,5</sup>

Impairment of the neuron recovery process leads to residual damage due to the combined effect of primed-microglia from bacterial overgrowth magnify neuronal damage and excessive pro-inflammatory cytokines.<sup>6,7,8</sup>

Vagus nerve stimulation shifts microglia phenotype from M1 inflammatory type to the M2 anti-inflammatory types, suppresses systemic cytokine levels and induces neuroplasticity.<sup>11,12,19</sup>

Primed M1-microglia magnify neuronal damage and impair recovery resulting in cumulative brain injury (CBI).



Cumulative brain injury occurs when residual damage accumulates with each injury, and can be detected with spectral analysis of the autonomic nervous system.

tVNS is simple and inexpensive, and when used as part of the Nemechek Protocol can reverse symptoms of Alzheimer's dementia<sup>17</sup> and combat-associated PTSD<sup>18</sup>.

The Nemechek Protocol may prove effective for many other chronic medical conditions (Parkinson's, ALS, macular degeneration, essential tremor, generalized anxiety, ADD, autism, depression, fatigue, migraine headaches, cancer, cardiovascular disease) are associated with microglia dysfunction and elevated pro-inflammatory cytokines.

METHODS

Treatment and autonomic monitoring were performed as part of routine care at Nemechek Autonomic Medicine, a clinic specializing in the treatment of autonomic disorders.

76 subjects (48% male, 52% female, average age - 64 y/o, aver. BMI 34.3) underwent autonomic spectral analysis (ANX 3.0, ANSAR) as part of their routine care for autonomic dysfunction. Subjects were included for analysis according to inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Documented autonomic assessment at baseline and repeat assessment within 2-4 months after initiation of the Nemechek Protocol.	Documentation of complete non-adherence to any single aspect of treatment regimen.

All subjects were started on the Nemechek Protocol, a regimen designed to normalize brain recovery mechanisms though shifting of microglia to the M2-phenotypes and/or suppression of systemic pro-inflammatory cytokines.

The Nemechek Protocol consists of:

- tVNS (5 Hz, 250 uS, 1 mA, continuous), 2-4 hours (cumulative time on device), patient-administered via the tragus or concha) daily.
- Rifaximin, 550 mg twice daily x 10 days
- Fish Oil containing 3,000 mg of DHA and 1,500 mg of EPA daily.
- 30 ml of EVOO containing an estimated 8 grams of oleic acid daily.
- ¼ cup of nuts, 1 tbsp. of ground flax or 1,000 mg flax oil capsule daily.

Autonomic assessments were performed via spectral analysis (ANSAR Inc., ANX 3.0) every 2-3 months as part of routine management of the patient.



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For More Information: [dr@autonomicmed.com](mailto:dr@autonomicmed.com)



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