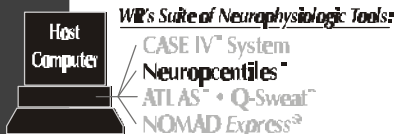


NEUROPCENTILES™



An Automated Database of Normative Results for Peripheral Nerve Tests

Quantitative Sensation Testing (QST)

- *Vibration, Cold, and Heat-Pain Thresholds (HP:5.0, HP:0.5, and HP:5.0-0.5)*

Autonomic Testing

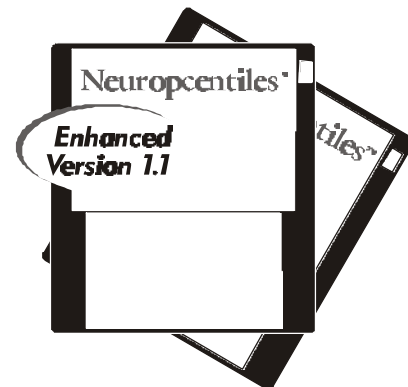
- *Pulse Response to Deep Breathing, ^{APDB} the Valsalva Maneuver, ^{APVM} and CASS*

Neuropathy Symptom Profile (NSP)

- *Includes N, W, S, and A scores (normal deviates)*

Nerve Conduction Studies (NCS)

- *Motor Nerve Conductions of Ulnar, Median, Peroneal, and Tibial Nerves — CMAP and MNCV*
- *Sensory Nerve Conduction Studies of Ulnar, Median, and Sural Nerves — SNAP, SNCV, and Latency Measurements*



ABOUT NEUROPCENTILES™

Neuropcentiles™ is a software program that enables automated conversion of a patient's raw QST, NCS, and autonomic test results into specific percentile and normal deviate values, taking age and anthropometric characteristics into account. The operator enters the test used, test results, site tested, and physical variables such as age, gender, height, and weight. The software then calculates a meaningful percentile and normal deviate, placing the patient in the range of hypersensitivity to hyposensitivity based on a distribution of values in a normative population.

Population Description: More than 300 healthy subjects from Rochester, MN, selected at random from lists of the Rochester population by gender and hemidecade between 18 and 74 years of age. Cohort was judged to be representative of a Caucasian population in northern U.S. cities.

Neuropcentiles™ is a valuable tool for:

- Clinicians
- Investigators
- Pharmaceutical companies
- Neurodiagnostic device manufacturers

Available in a variety of formats:

- Stand-alone application
- Integrated with the CASE IV™ System
- Custom packaging for use with other systems and devices

System requirements:

- 486/33 or better, 16 meg memory or better
- Operating system: DOS 6.0 or higher, Windows 95/98

Please also see the further description of Neuropcentiles™ on reverse.

ABOUT THE NEW, ENHANCED VERSION 1.1:

- Percentiles and normal deviates are derived using a more extensive data model.
- The addition of more data points, improved data modeling, and increased resolution of the percentile and normal deviates allows for the recognition of smaller changes in test results, independent of physical variables.
- All calculations are now based on complete data for all anatomical locations and modalities.
- Additional anatomical locations have been added (foot, lateral leg, thigh, shoulder, forearm, hand, and face).
- Extensive data modeling has been used to establish increased precision and resolution at the upper and lower limits of the data (near the 0th and 100th percentile).
- Percentile and normal deviate tables are now calculated with greater resolution.
- The calculation of percentiles and normal deviates for vibration detection thresholds has been improved.
- The improved software and data can be very useful in establishing composite scores (cross additions over several modalities), which can be a powerful tool in the measurement of neuropathy.

NOTES:

- Data copyright by Mayo Foundation for Medical Education and Research
- Software developed by WR Medical Electronics Co. based on results obtained by P.J. Dyck, W.J. Litchy, P.A. Low, and P.C. O'Brien, published in "Variables influencing neuropathic endpoints: The Rochester Diabetic Neuropathy Study of Healthy Subjects," by P.J. Dyck, MD; W.J. Litchy, MD; K.A. Lehman; J.L. Hokanson, BA; P.A. Low, MD; and P.C. O'Brien, PhD. *Neurology* 1995;45: 1115-1121.
- WR is not selling the data, which exists in the public domain. Any charge is for WR's programming services.
- This product is not designed to be used in the diagnosis of any disease, nor is it to be used to treat any disease.

WR-MEDICAL ELECTRONICS CO.

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FURTHER DESCRIPTION OF NEUROPCENTILES™

Neuropcentiles™ is a software program that enables automated conversion of a patient's raw QST, NCS, and autonomic test results into specific percentile and normal deviate values. For example, vibration threshold is recorded as a step of stimulus magnitude or as micrometers (μm) of vertical displacement. To be meaningful, one needs to know where this value occurs in the range of hypersensitivity to hyposensitivity. Because vibration sensation varies with age, sex, height, weight, and other anthropometric features, expressing results as a step function or as μm of displacement only is unsatisfactory. One needs to understand how the result relates to the distribution of values in a normative population.

The procedure for estimating percentiles has been outlined by Peter C. O'Brien, PhD., and Peter J. Dyck, MD.¹ More than 300 persons from Rochester, MN, excluding by exami-

nation patients with neurologic disease or diseases predisposing to neuropathy, were tested. Specific percentiles were then estimated for modality (such as vibration), site (such as great toe), age, and anthropometric characteristics.² By entering the raw vibration detection threshold value and biographic and anthropometric characteristics into the Neuropcentiles™ program, the specific percentile value is calculated using the normal subject's data.^{1,2} This percentile is also given as a normal deviate, which relates percentiles to a normal distribution. For example, for the fiftieth percentile, the corresponding normal deviate is 0, since 50 percent of values in a normal distribution fall below 0. The normal deviate corresponding to the ninety-fifth percentile is 1.96, since 95 percent of values in a normal distribution fall below 1.96. Each attribute of nerve conduction entered into Neuropcentiles™ is similarly

converted to a specific percentile and normal deviate value.

There are major advantages to having nerve tests expressed as a percentile or as a normal deviate. The first is that it allows a direct, simple comparison of a test result to a normal distribution, which is a better estimate of abnormality than simply deciding whether a test result is normal or abnormal. The estimate takes more than age into account in expressing abnormality. To illustrate, for some attributes of nerve conduction height is as important a variable as age in determining the percentile position, whereas for other attributes weight or body mass index are important variables. The use of percentiles or normal deviate also permits comparison of the same person over time when age or anthropometric characteristics have changed. Use of normal deviates is very useful in epidemiologic studies and controlled clinical trials.^{3,4}

¹O'Brien PC, Dyck PJ. *Neurology* 1995;45: 17-23.

²Dyck PJ, et al. *Neurology* 1995;45: 1115-1121.

³Dyck PJ, et al. *Neurology* 1997;49: 229-239.

⁴Dyck PJ, et al. *Diabetes Care* 1999;22: 1479-1486.