

... only 32% of the type 2 diabetics exhibit no nerve dysfunction of the heart, 31% slight dysfunction, a further 31% intermediate dysfunction, and 6% serious dysfunction*

31%

31%

6%

DIABETES
nerve dysfunction of the heart

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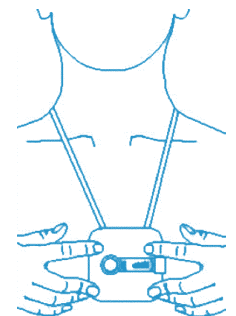
clue medical – is multifunctional and ...

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Part of the nervous system – the so-called autonomic nervous system – regulates basic bodily functions such as heartbeat, blood pressure, breathing and metabolism. We know that it has two important parts: the sympathetic nervous system and the parasympathetic nervous system.

When you suffer from stress, the sympathetic nervous system is activated. When you are calm, the parasympathetic nervous system dominates. You can feel that when you take your pulse, which essentially indicates your heart rate, that is, the number of heartbeats in a given period of time.

Your heart rate is not always the same, because the heart responds to external and internal influences. When you exercise for instance, or when climbing stairs, your heart rate increases. This is also the case when you breathe in and out deeply. This continuous change in heart rate is called **heart rate variability (HRV)**. In other words: your HRV is crucially based on the interaction between the sympathetic and the parasympathetic parts of the autonomic nervous system.

During normal nerve function, your heart rate continuously changes due to breathing, heart beat and therefore also under stress. If nerve function is impaired, these changes are only minor. Such people have less energy and therefore easily overexert themselves. An impaired

HRV is thus an early sign that nerve function is impaired. This may, for instance, be caused by cardiac insufficiency, high blood pressure and diabetes. If undetected, it is a risk factor for premature death from heart disease (1).

Early detection of such disorders is therefore extremely important for diabetics. The American Diabetes Association (ADA) thus recommends that HRV measurements are taken at the point of diagnosis in type 2 diabetics, and five years after onset of the disease in type 1 diabetics (2).

As part of an observational study, type 2 diabetics used the telemedical device clue medical to measure HRV over a longer period of time. The average age of the patients was 60 and the average time since diagnosis was three years. Their blood sugar control was good to satisfactory. Average long-term blood sugar level HbA1c was below 7 %.

Despite satisfactory blood sugar control, which given their relatively recent onset of the disease permitted treatment through diet/tablets, **only 32 % of type 2 diabetics who took part in the study had no nerve dysfunction of the heart, 31% had slight dysfunction, a further 31% had intermediate dysfunction, and 6% had serious dysfunction (4).**

This clearly indicates that the problem exists in many diabetics but is often unrecognised and that such HRV measurements are necessary in order to detect and treat serious heart problems early on. The same studies carried out 12 months later with diabetics who were also given a drug that improves insulin sensitivity (pioglitazone, insulin sensitiser) further indicated that this makes sense. Once the HbA1c value was lowered by 0.7%, the percentage of patients without HRV dysfunction had increased to 41%.

*** Sources:**

Kleiger RE, Miller JP, Bigger JT Jr, Moss AJ: Multicentre Post Infarction Research Group: Decreased heart rate variability and its association with increased mortality after acute myocardial infarction. Am J Cardiol 1987; 59: 256-62.

Boulton AJM, Vinik AI, Arezzo JC, Bril V, Feldman EL, Freeman R, Malik RA, Maser RE, Sosenko JM, Ziegler D: Diabetic Neuropathies, A statement by the American Diabetes Association. Diabetes Care 2005; 28: 956-962

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Schönauer M, Schreiner M, Thomas A, Luppä H-C, Hirmer A: Pioglitazone – Effects on Metabolic Control, Blood Pressure and Heart Rate Variability in Patients with Type-2-Diabetes Mellitus 65th ADA Scientific Session 2005, San Diego, 505-P, Diabetes 54, Suppl.1 (2005), A125



Cardiac Monitoring in Motion.

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