

# Heart Rate Variability in an Experimental Model of Obesity

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## Introduction and Hypothesis

The autonomic nervous system modulates heart rate and myocardial contractility allowing for adjustments of cardiac output to meet hemodynamic requirements under various conditions.

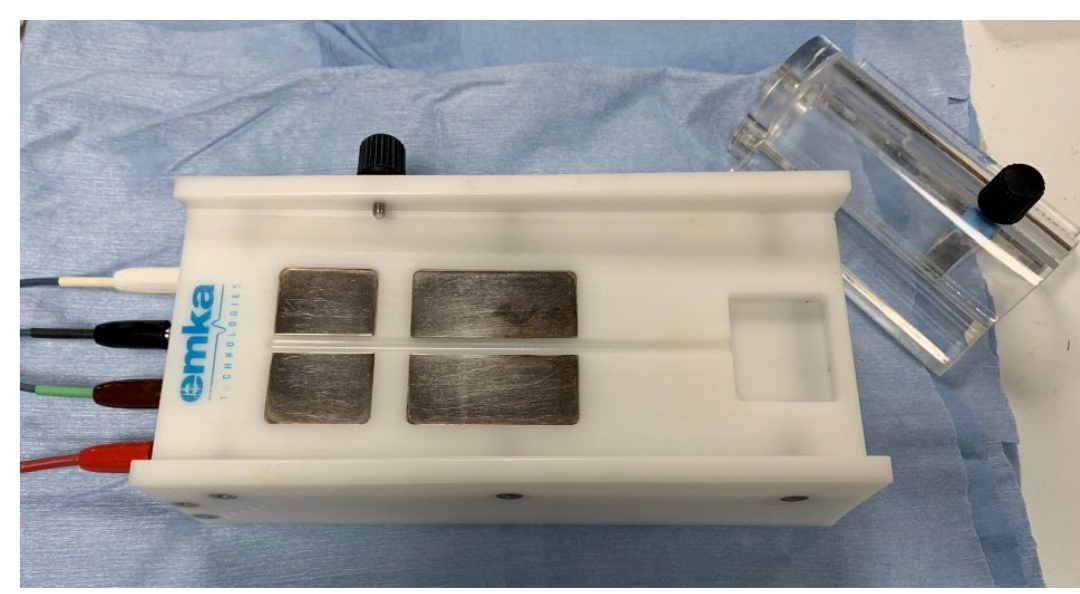
Cardiac autonomic regulation occurs via feedback loops involving afferent sensory information moving from the heart to central nervous system and efferent cardiomotor neural impulses originating in the nervous system and returning to the heart.

In this study we addressed the possibility that obesity and metabolic syndrome are coupled with dysregulation of the autonomic control of the heart.

## Material and Methods

Young C57Bl/6 female mice were fed with Western diet (WesD) containing 2% NaCl to induce metabolic syndrome. Animals fed with a control chow were used for comparison.

To evaluate heart rate variability (HRV), electrocardiograms (ECGs) were collected in conscious, restrained mice using an ECG-tunnel device equipped with surface electrodes. Moreover, echocardiography was employed to assess cardiac function.



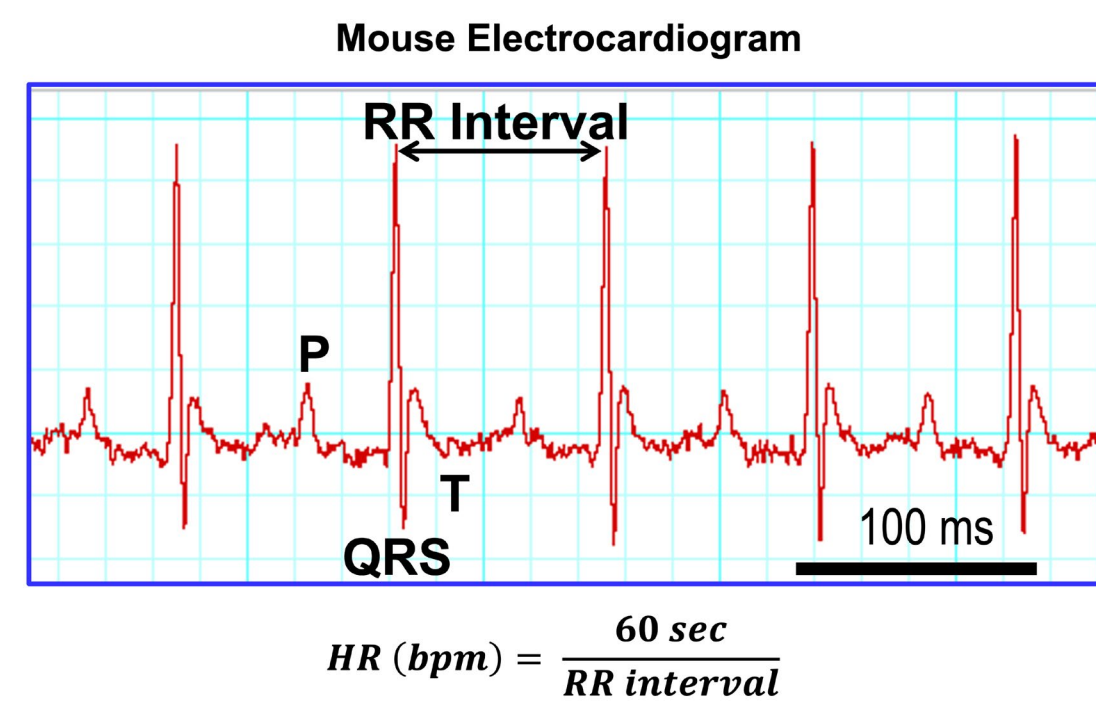
## HRV Parameters

Time-domain variables of HRV were employed:

**Average RR:** average of RR intervals during the period of data acquisition;

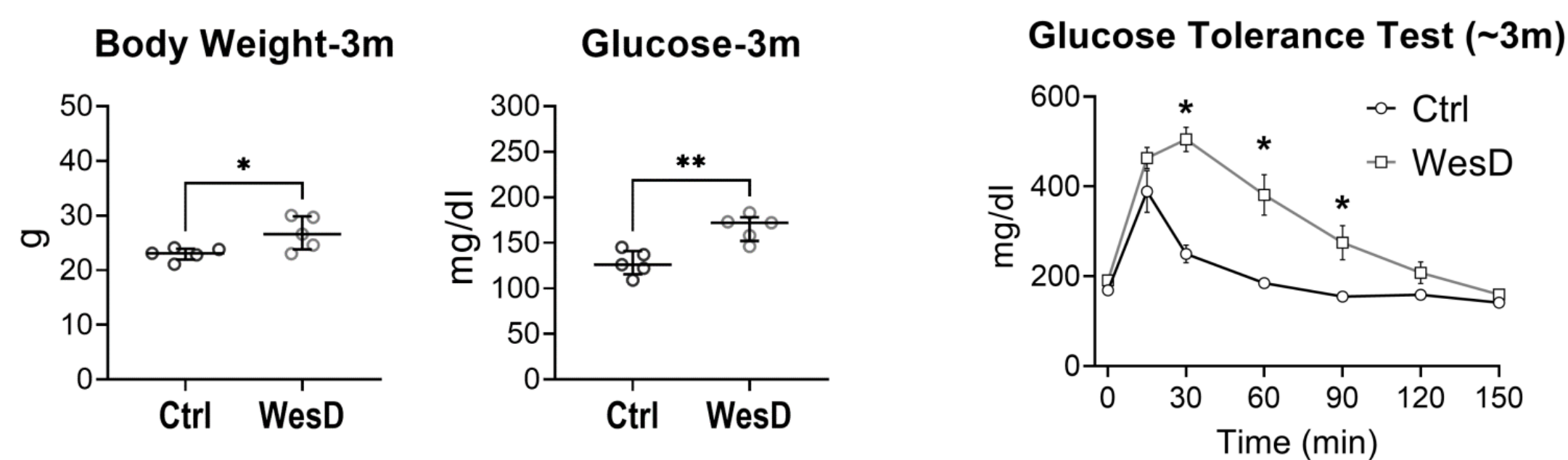
**SDRR:** standard deviation of RR intervals;

**RMSSD:** square root of the mean of differences between contiguous RR intervals (beat-to-beat or short-term variability).



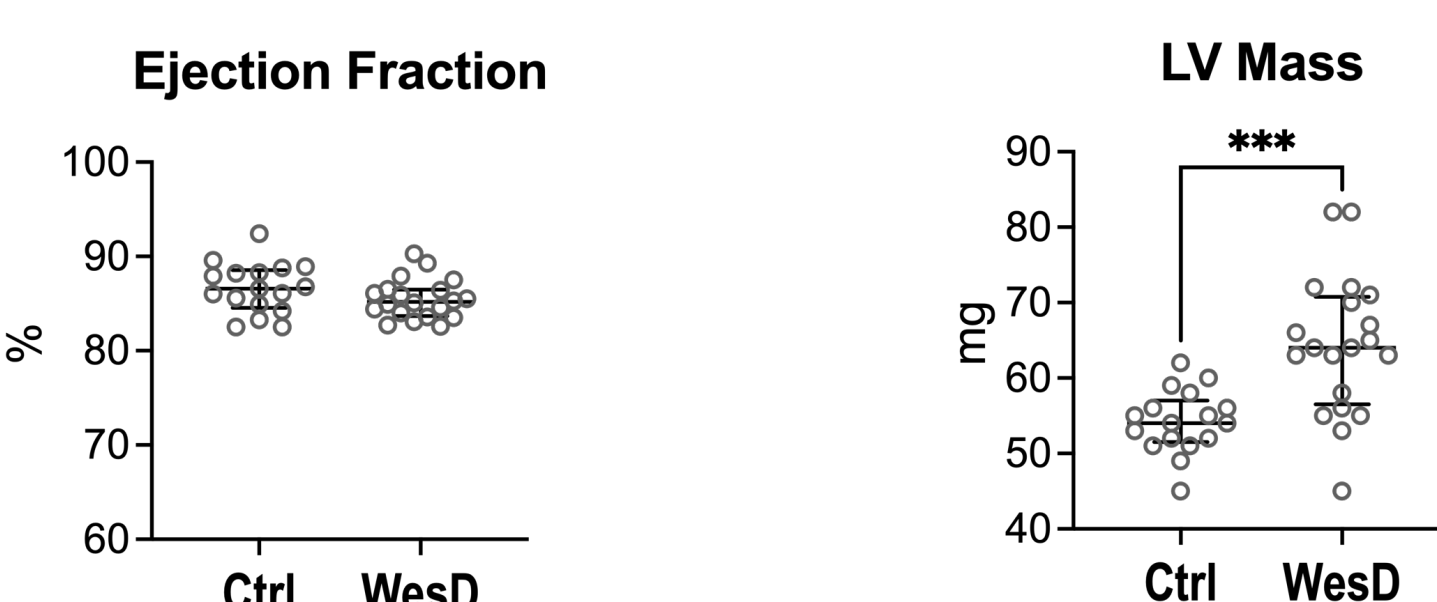
## Body Weight and Blood Glucose

Exposure to Western diet is accompanied with increase in body weight and depressed ability of animals to metabolize glucose.



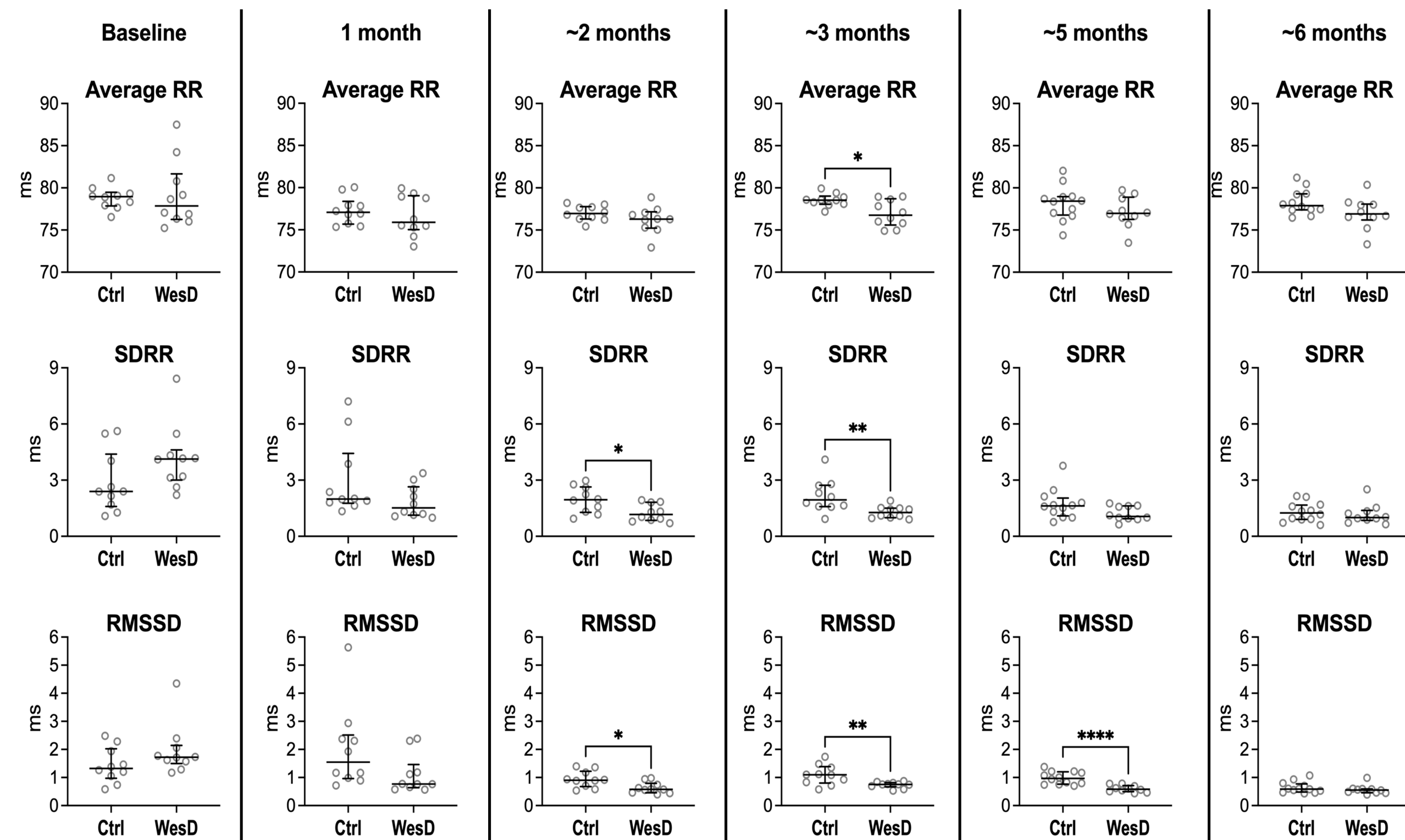
## Cardiac Function

Exposure to Western diet does not alter cardiac function but it is accompanied with cardiac hypertrophy



## HRV

Exposure to Western diet alters heart rate dynamics.



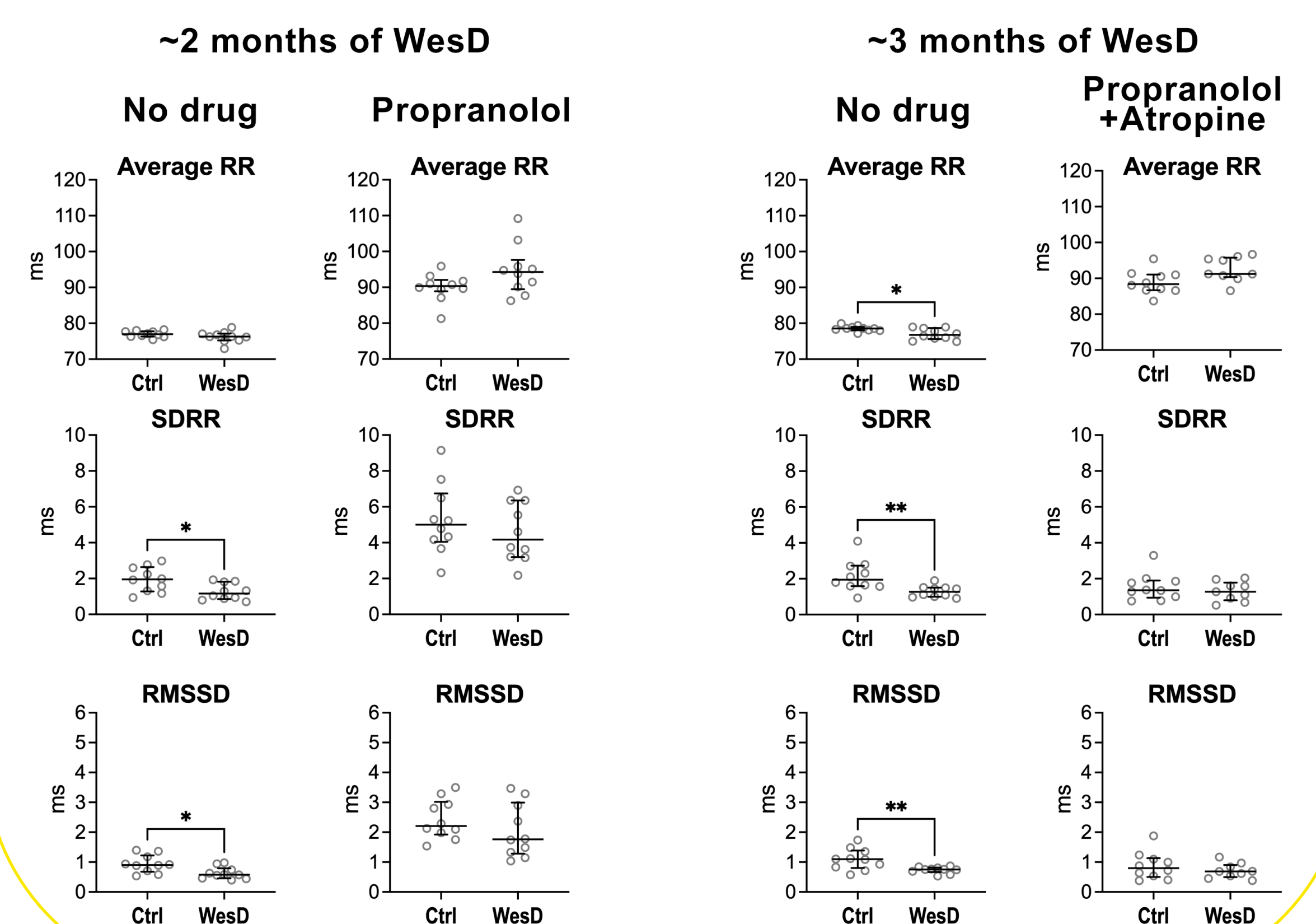
Observed results are consistent with increased sympathetic and/or decreased parasympathetic tone.

WesD vs. Ctrl	Possible factors (and/or)	
↓ Average RR (↑ HR)	↑ sympathetic	↓ parasympathetic
↓ SDRR (↓ HRV)	↑ sympathetic	↓ parasympathetic
↓ RMSSD (↓ beat-to-beat HRV)	↑ sympathetic	↓ parasympathetic

## Modulation of the Autonomic Nervous System

Inhibition of sympathetic tone appears to be sufficient to abrogate the effects of Western diet on HRV.

Combined autonomic block reveals the contribution of both sympathetic and parasympathetic tone in modulating RR interval duration and HRV.



## Conclusions

Metabolic syndrome induced by Western diet is coupled with structural remodeling and altered autonomic regulation of the heart.

Enhanced sympathetic tone appears to be responsible for the reduced HRV in mice exposed to Western diet.