Biological Cybernetics
Electronic Supplementary Material to
Cardiovascular regulation in response to multiple hemorrhages: Analysis and parameter estimation

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1 Data calibration

Figure 1 shows previously unpublished exponential fit to the data used in the volume catheter calibration for the animal at baseline.

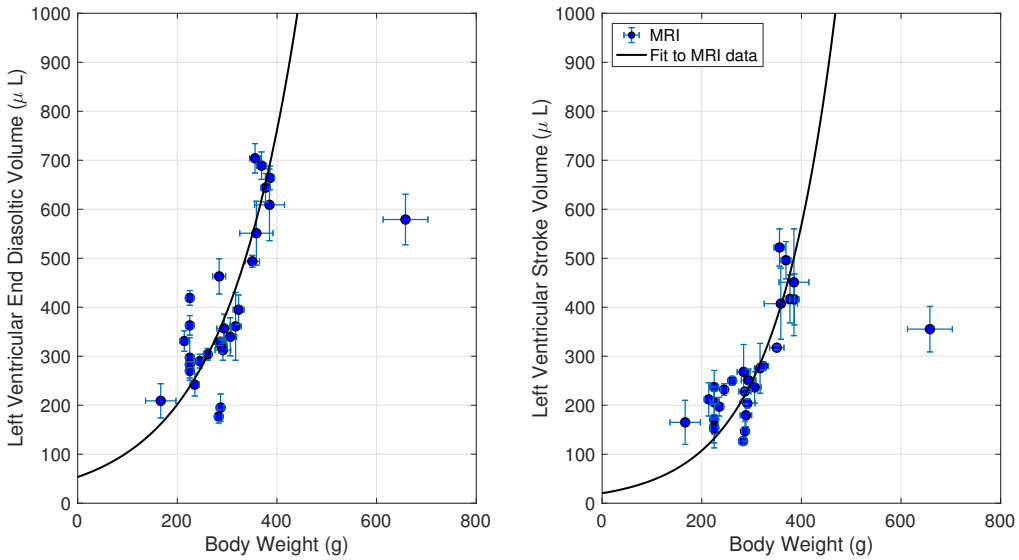

Figure 1: Left: Data and model fit from 13 MRI studies showing left ventricular end diastolic volume as a function of body weight for control rats. These data was related exponentially as $LVEDV = 281.2\exp(1.66(W/250 - 1))$, where W is body weight in grams and $LVEDV$ is left ventricular end diastolic volume in μl. Right: Fit to data from 13 MRI studies showing left ventricular stroke volume as a function of body weight in control rats. Again, data follow an exponential form: $LVSV = 163\exp(2.08(W/250 - 1))$, where $LVSV$ is left ventricular stroke volume.

2 Additional figures and table

2.1 Spline fits of additional blood withdrawals

Figure 2 shows model fits to blood withdrawals 1, 3, and 4 (as in Figure 5 in the main text) using time-varying parameters E_m, E_M and R_s estimated using the spline method (Figure 2). The least squares error for these fits are given in Table 1.

Table 1: Mean square error associated with the spline optimization for blood withdrawal BWi, $i = 1 \ldots 4$.

Cost	BW1	BW2	BW3	BW4
J (E+3)	2.68	5.02	6.56	2.83

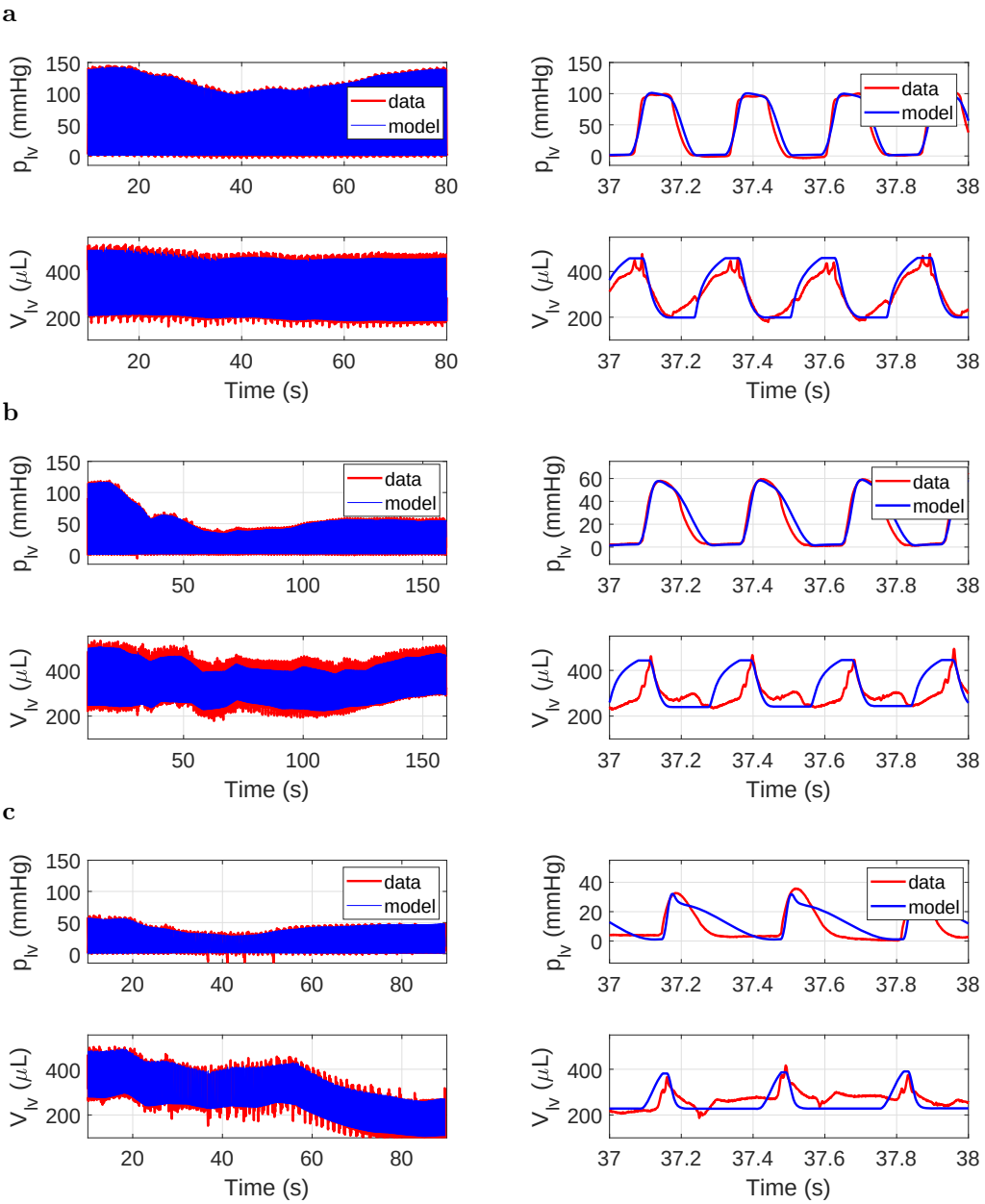

Figure 2: Fits of left ventricular pressure (p_{lv} (mmHg)) and volume (V_{lv} (μl) for blood withdrawal 1 (**a**), blood withdrawal 3 (**b**) and blood withdrawal 4 (**c**) using the proposed model and spline optimization. Right: Zoom over a one-second interval during blood withdrawal.

2.2 Coupling functional form results

Finally, results using the functional forms within the cardiovascular model (for blood withdrawal 1) is shown in Figure 3 using parameters given in Table 5 in the main text.

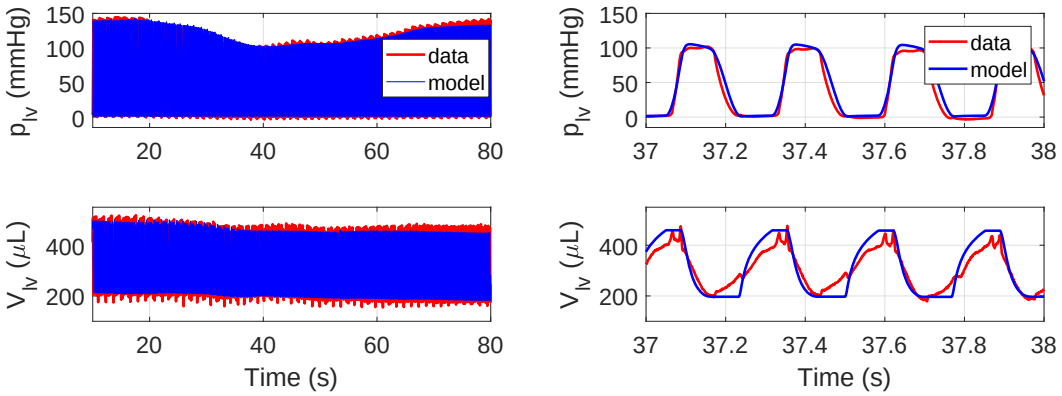

Figure 3: Left: Fit of left ventricular pressure p_{lv} (mmHg) and volume V_{lv} (μl) for blood withdrawal 1 coupling the functional forms with the cardiovascular model. For this fit, $J = 2.92\text{E+}3$. Right: Zoom over a one-second interval during the blood withdrawal.