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A.C. Fowler · M.J. McGuinness

A delay recruitment model of the cardiovascular control system

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$$\varepsilon_H \dot{h} = \frac{\beta g(p_1)}{1+\gamma[1-g(p)]} - \nu[1-g(p)] + \delta(1-h) \ ,$$

$$\varepsilon_a \dot{p} = -\frac{p}{1+\alpha g(p_1)} + \mu h \ ,$$

Table 1. Parameter values

Parameter	Definition	Value
C_a	arterial compliance	1.55 ml mm Hg^{-1}
C_v	venous compliance	50 ml mm Hg^{-1}
R_c^0	min arteriole resistance	0.6 mm Hg s ml^{-1}
R_v	venous resistance	0.016 mm Hg s ml^{-1}
ΔV	stroke volume	50 ml
H_0	uncontrolled heart rate	100 min^{-1}
P_0	arterial pressure	100 mm Hg
τ	sympathetic delay	3 s
V_H	vagal tone	1.17 s^{-2}
β_H	sympathetic control of heart rate	0.84 s^{-2}
α	sympathetic effect on R_c	1.3
γ	vagal damping of β_H	0.2
δ_H	relaxation time	1.7 s^{-1}

Table 2. Nondimensional parameter definitions and values

Parameter	Definition	Value
ε_a	$C_a R_c^0/\tau$	0.3
ε_v	$C_v R_c^0 \mu\rho/\tau$	0.15
ε_H	$1/(H_0\tau)$	0.18
α	sympathetic effect on R_c	1.3
β	β_H/H_0^2	0.3
γ	vagal damping of β_H	0.2
δ	δ_H/H_0	1
μ	$R_c^0 H_0 \Delta V/P_0$	0.5
ν	V_H/H_0^2	0.4
ρ	R_v/R_c^0	0.03