S2 Fig. Shifting of the POP and MDP levels in the pAP and pCN models.

1) Modified pAP/AP model. The parameter $u_M$ changes the MDP (rest) value, and $u_P$ changes the amplitude of the transmembrane potential (POP value).

\[
\frac{\partial u}{\partial t} = c_t [k(u - u_M)(u + b_{AP})(u_P - u) - (u - u_M)v]
\]

\[
\frac{\partial v}{\partial t} = c_t \epsilon [-v - k(u - u_M)(u - a - u_P)]
\]

\[
\epsilon = \epsilon_0 + v \mu_1/(u - u_M + \mu_2)
\]

|                | $k$  | $a$  | $\mu_1$ | $\mu_2$ | $b_{AP}$ | $u_M$ | $u_P$ |
|----------------|------|------|----------|----------|----------|-------|-------|
| Original pAP model | 8    | 0.13 | 0.2      | 0.3      | 0.02     | 0     | 1.0   |
| Modified pAP model  | 0.22 | -0.2 | 0.8      |          |          |       |       |

2) Modified pCN/CN model. The parameter $u_M$ changes the MDP (rest) value, and $u_P$ changes the amplitude of the transmembrane potential (POP value).

\[
\frac{\partial u}{\partial t} = h(u - u_M)(u + b_{CN})(u_P - u)/\tau_{in} - (1 - h)(u - u_M)/\tau_{out}
\]

\[
h_{\infty} = 0.5 \left[1 - \tanh \left((u - u_M - \mu_{gate})/u_s\right)\right]
\]

|                | $\tau_{in}$ | $\tau_{out}$ | $\tau_{open}$ | $\tau_{close}$ | $u_s$ | $u_{gate}$ | $b_{CN}$ | $u_M$ | $u_P$ |
|----------------|-------------|---------------|---------------|---------------|------|-----------|---------|-------|-------|
| Original pCN model | 0.3         | 6.0           | 120           | 150           | 0.15 | 0.01      | 0.30    | 0     | 1.0   |
| Modified pCN model  | 0.50        | -0.2          | 0.8           |              |      |           | 0.50    | -0.2  | 0.8   |