Electronic Supplementary Material (ESI) for Lab on a Chip
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Supplemental Figures

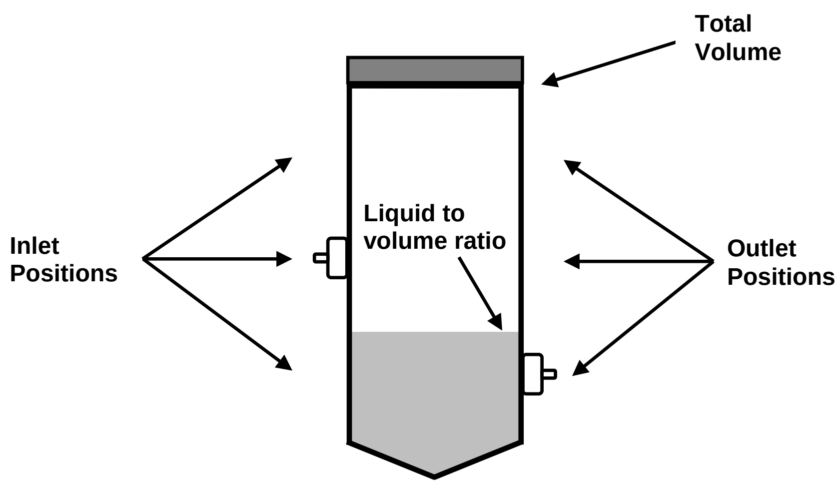

Figure S1. Prototype pulse dampener design with optimization parameters. The pulse dampener consists of an enclosed, fixed-volume chamber with an inlet and outlet. Inside, there is a variable liquid level with the rest of the volume taken up by trapped air. During the course of optimizing our system for pulsatility reduction, we focused on three parameters: 1) the total chamber volume, 2) the liquid to total volume ratio and 3) the position of the inlet and outlet.

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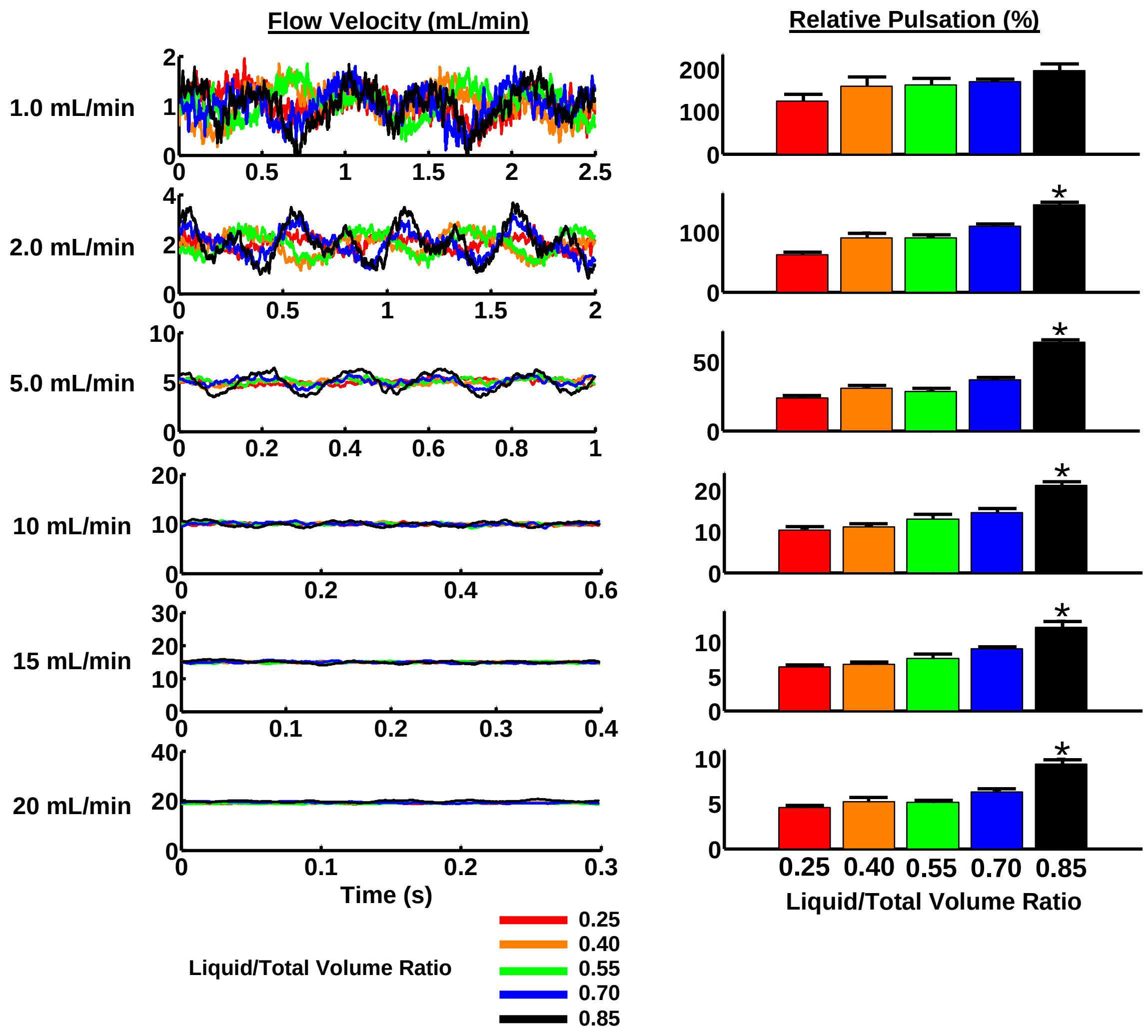

Figure S2. Effect of liquid ratio within the pulse dampener on variations in fluid flow. Liquid ratio reduces dampening capacity at high values. Flow waveforms were recorded using pulse dampeners filled to five different liquid fractional volumes: 0.25, 0.40, 0.55, 0.70, and 0.85. The inlet and outlet were in the middle and lower positions, respectively, and the total chamber volume was 15 mL. Relative pulsation was calculated as the ratio of peak-to-peak measurement divided by the mean flow rate. *At liquid volume ratio = 0.85, the system shows significantly higher values than the other four conditions ($p < 0.05$).

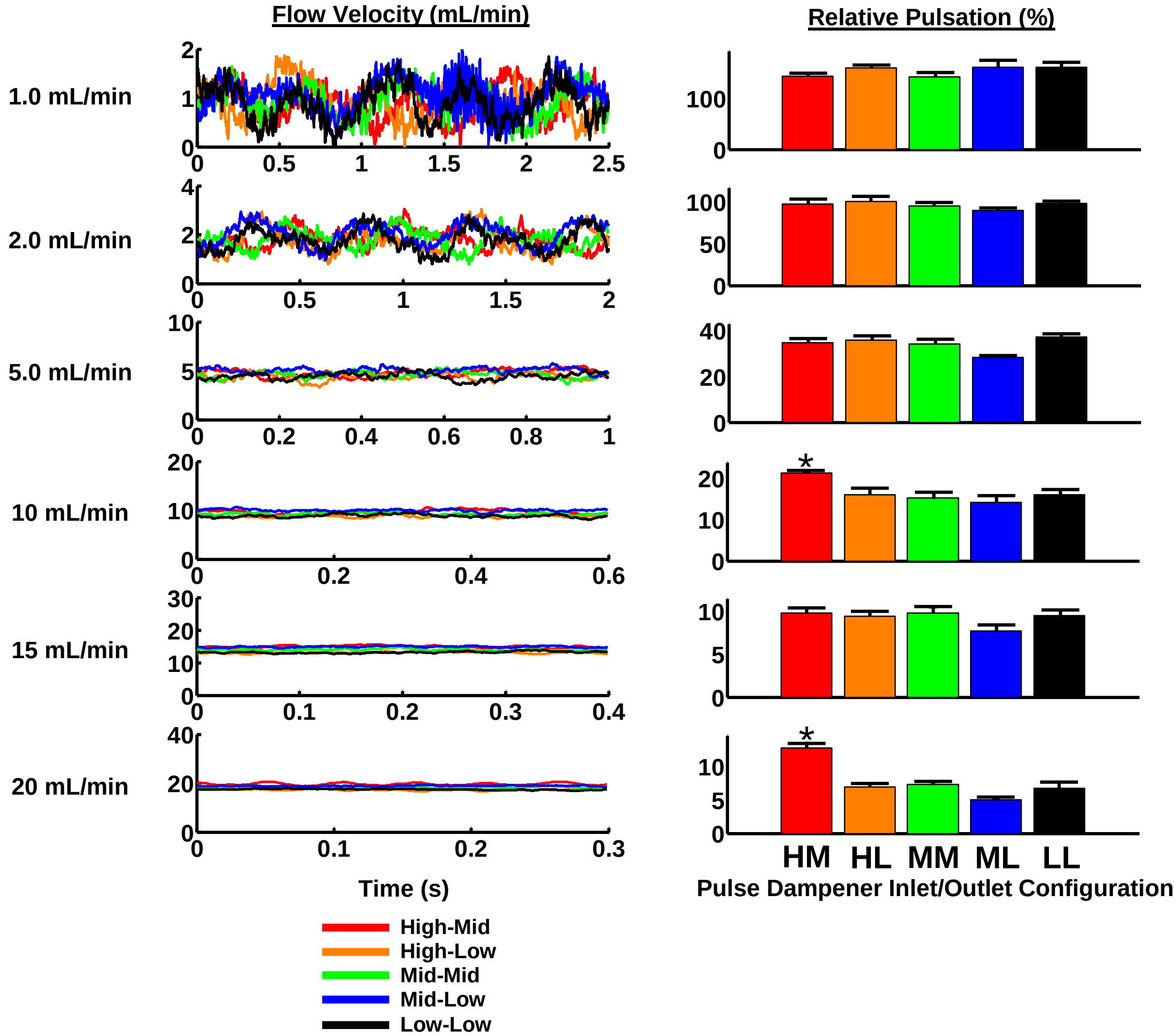

Figure S3. Inlet/outlet configuration has a minimal effect on system pulsatility. Only at the high-mid configuration does inlet/outlet configuration produce a significant effect and only then at high flow rates. Flow waveforms were recorded using the following inlet-outlet configurations: high-mid, high-low, mid-mid, mid-low, and low-low. Recordings were performed at liquid volume ratios of 0.24 and 0.55 and the total chamber volume was 15 mL. Relative pulsation was calculated as the ratio of peak-to-peak measurement to total flow rate. *At high-mid configuration, the system shows significantly higher values than the other four conditions ($p < 0.05$).

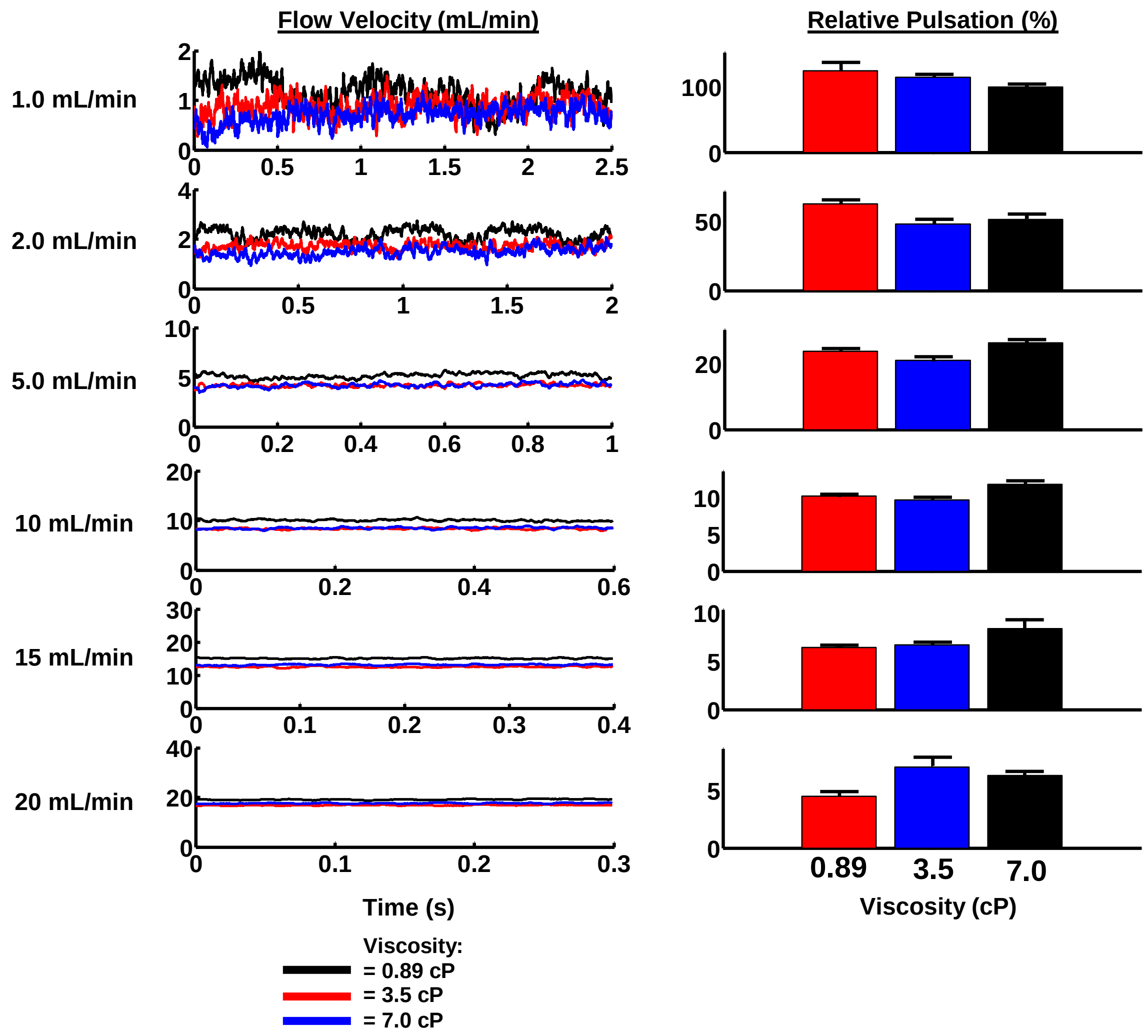

Figure S4. Optimized pulse dampener design is effective at increased viscosities. Using a higher viscosity media has little effect on the effectiveness of the pulse dampener system. Flow waveforms were recorded using pulse dampeners at three different viscosities: 0.89, 3.5, and 7.0 cP. The inlet and outlet were in the middle and lower positions, respectively, and the total chamber volume was 15 mL. Relative pulsation was calculated as the ratio of peak-to-peak measurement to total mean flow rate.