



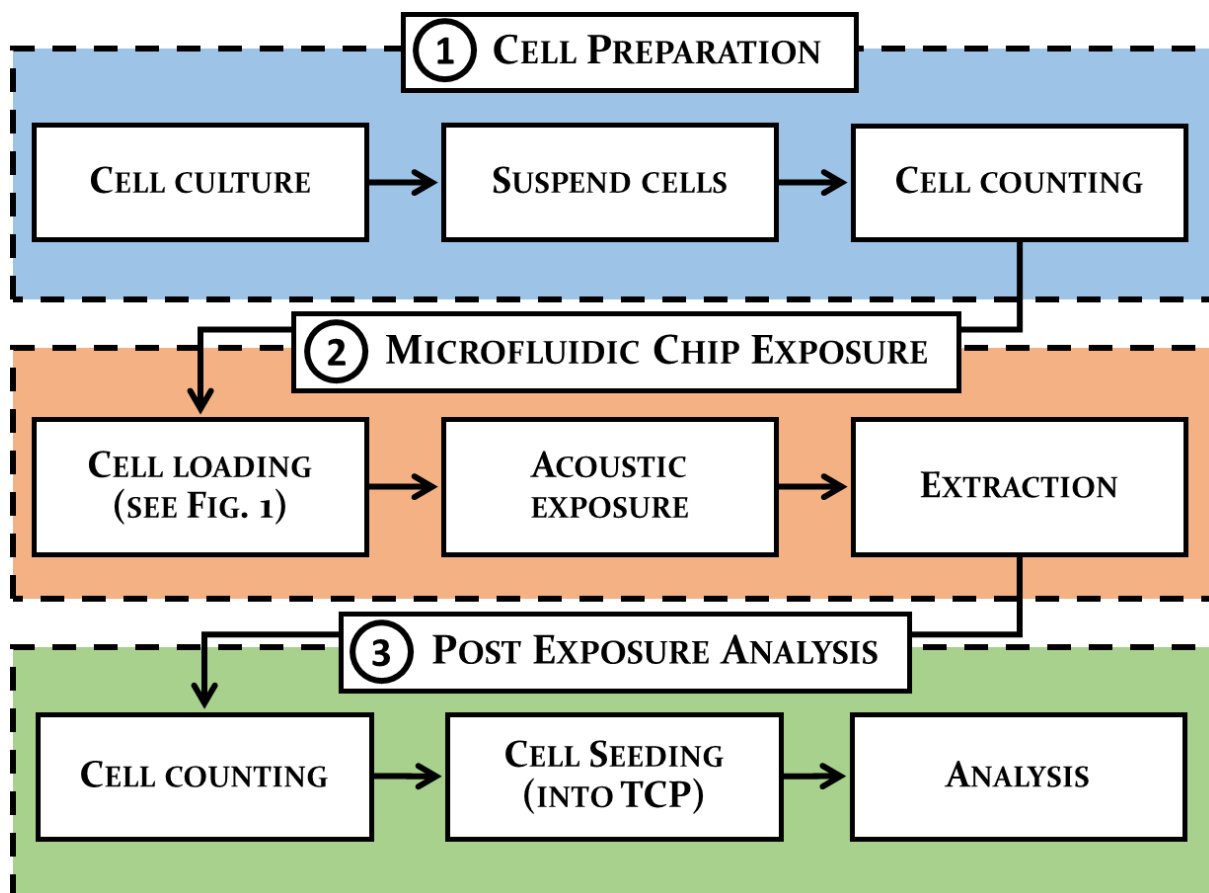
## Supporting Information

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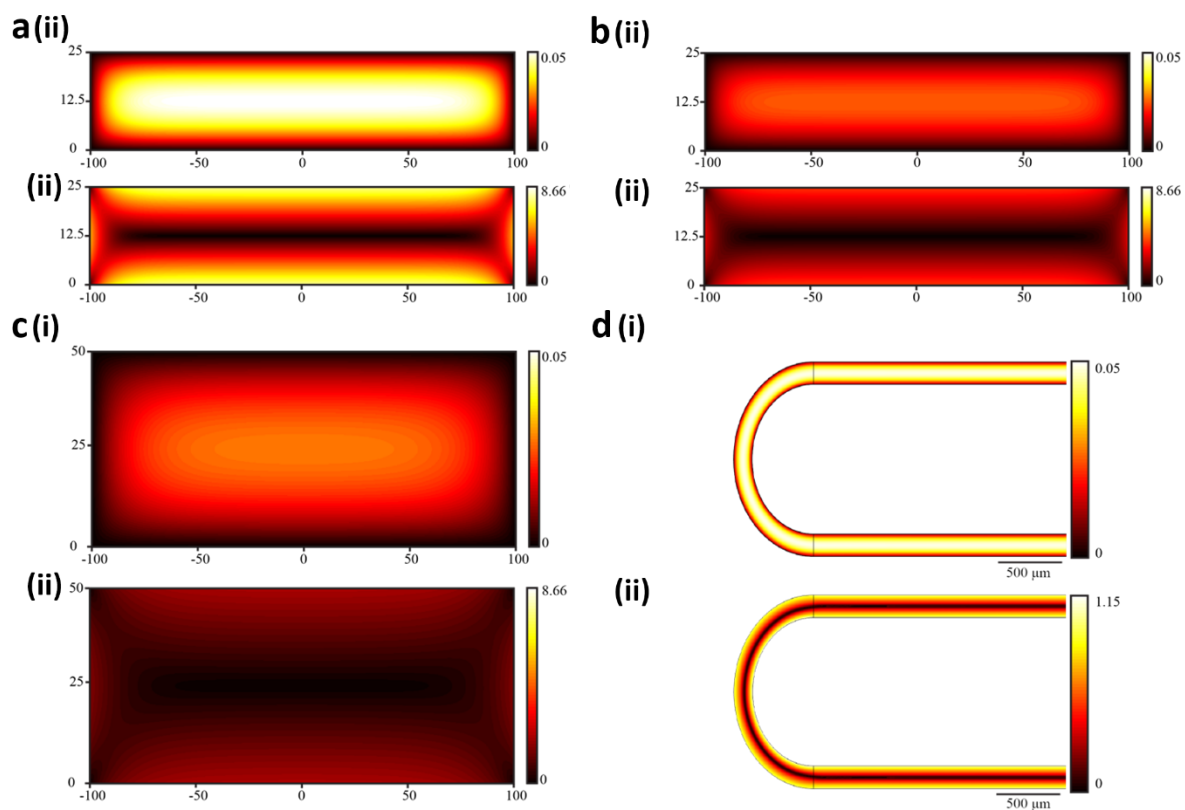
Cell Adhesion, Morphology, and Metabolism Variation via  
Acoustic Exposure within Microfluidic Cell Handling Systems

*Citsabehsan Devendran, James Carthew, Jessica E. Frith, and  
Adrian Neild\**

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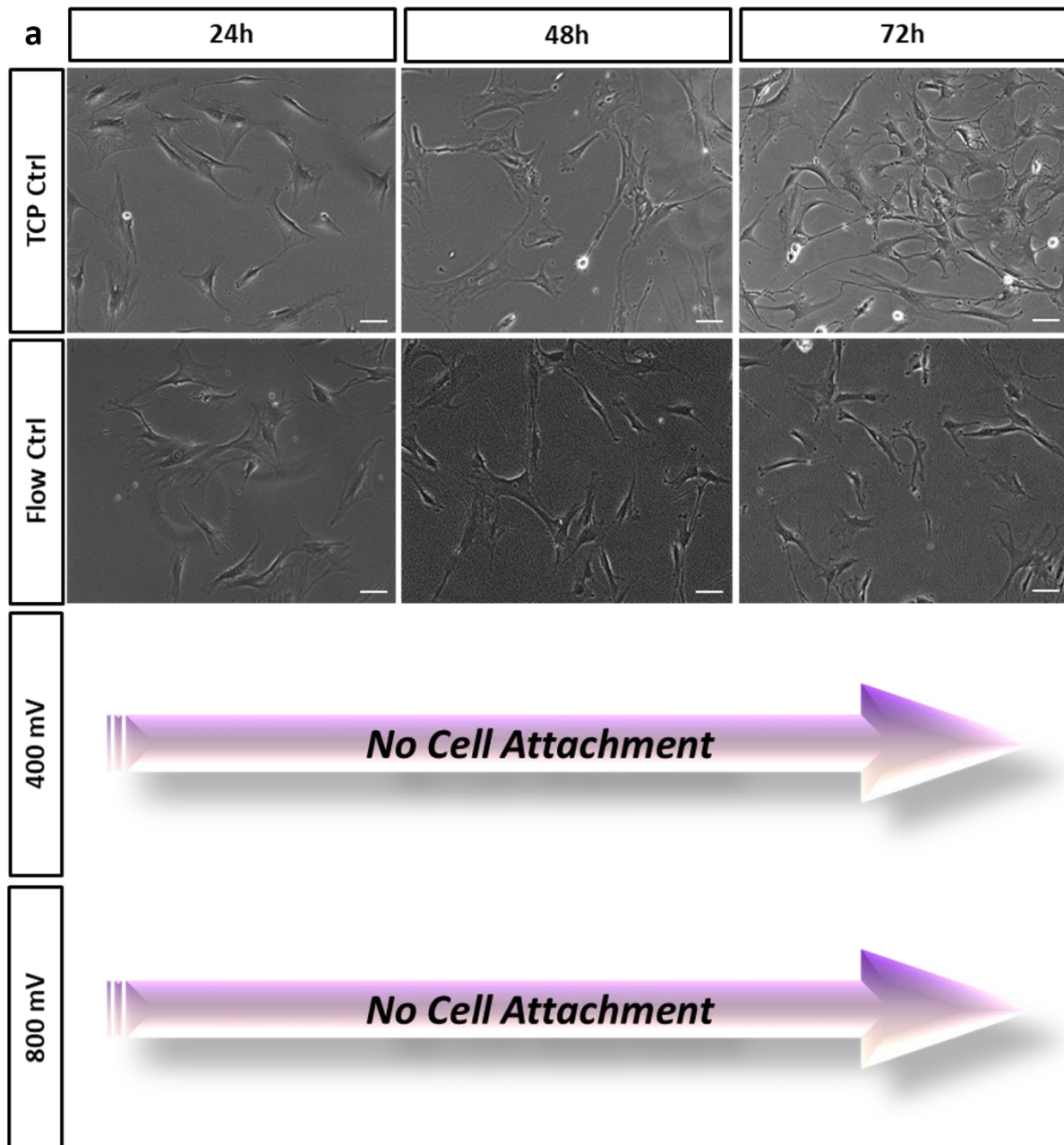
**Cell Adhesion, Morphology and Metabolism Variation via Acoustic Exposure within Microfluidic Cell Handling Systems***Citsabehsan Devendran, James Carthew, Jessica E. Frith and Adrian Neild\**

**Figure S 1.** The process flow diagram depicting the preparation of cells, exposure to varying acoustic conditions and subsequent analysis methods.

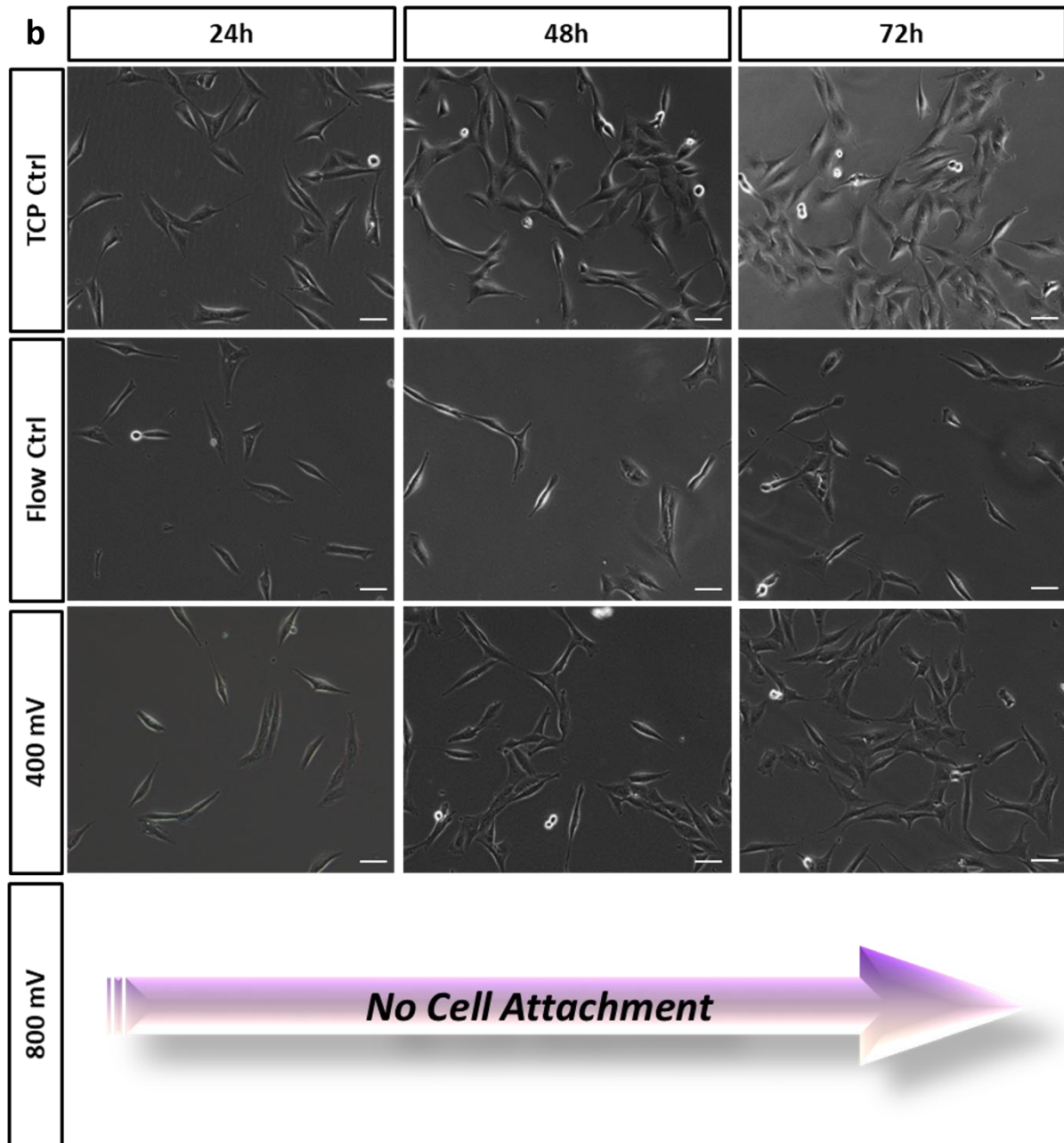


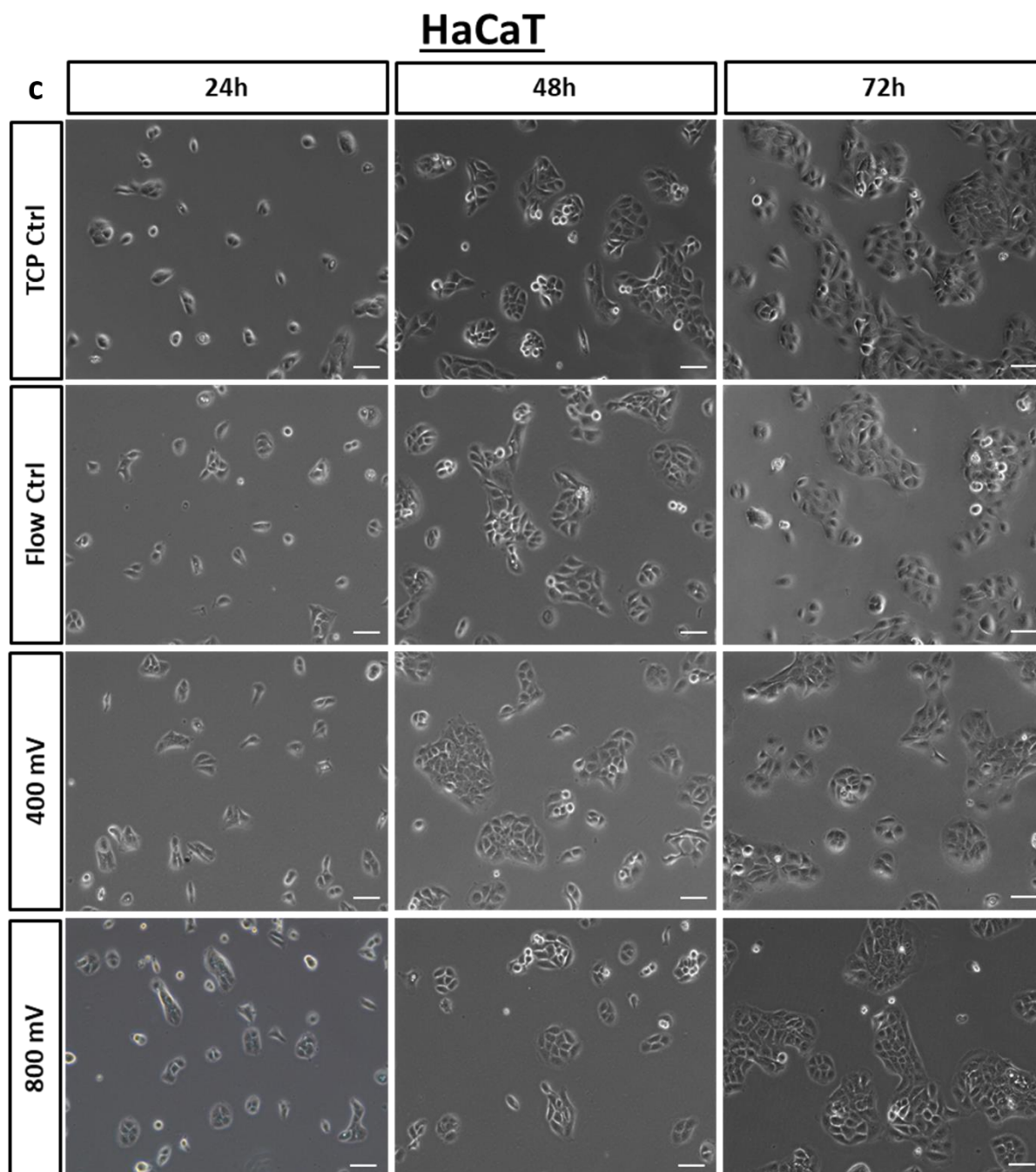
**Figure S 2.** Flow velocity (i) and shear profiles (ii) in the cross section view of the channel 25  $\mu\text{m}$  deep channel at  $10 \mu\text{L min}^{-1}$  (a), 25  $\mu\text{m}$  deep channel at  $5 \mu\text{L min}^{-1}$  (b) and 50  $\mu\text{m}$  deep channel at  $10 \mu\text{L min}^{-1}$  (c). The top view (d) of the flow velocity (i) and shear (ii) profile at the channel bend for a 25  $\mu\text{m}$  deep channel at  $10 \mu\text{L min}^{-1}$  scenario.

MSC



**MG63**

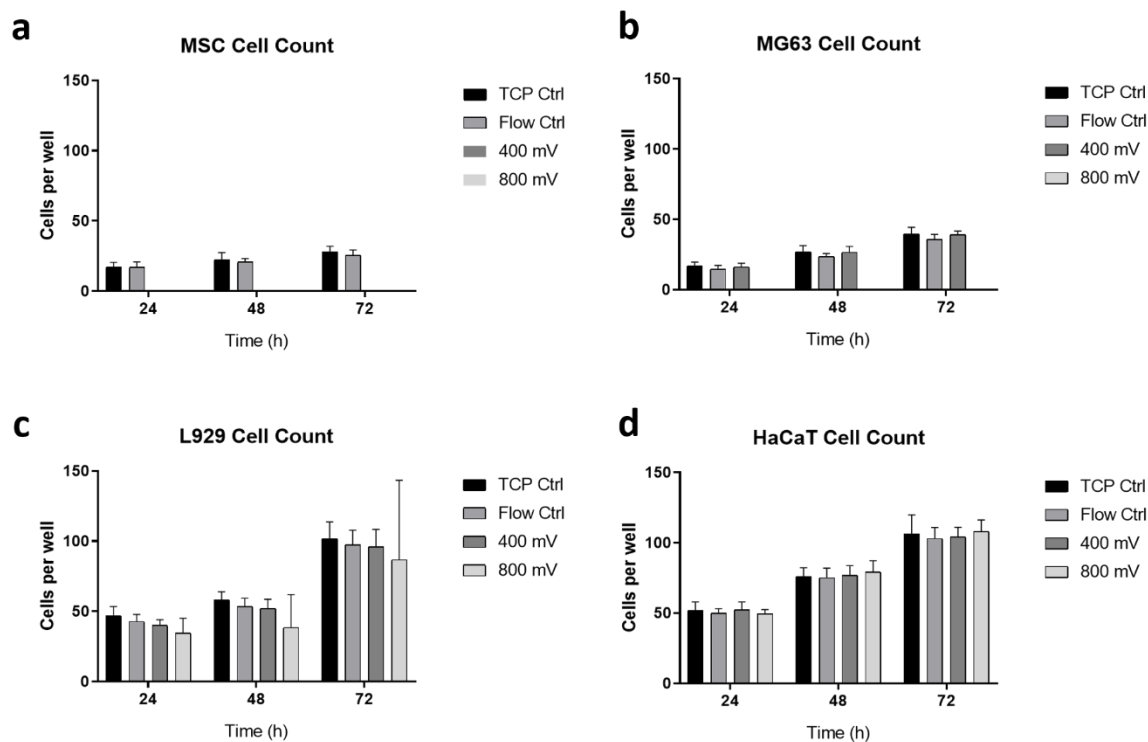




**Figure S 3.** Acoustic exposure resulted in no observed changes in cell attachment phenotypes. Phase contrast images for MSC, MG63 and HaCaT cells across 24 h, 48 h and 72 h post-exposure. Labels of no cell attachment denote scenarios in which cells could not adhere to the growth substrate post-exposure and thus could not be assessed. Scale bar, 50  $\mu\text{m}$ .

**Table S 1.** Quantification of 24 h live cell percentage calculated from live/dead fluorescence staining, with data presented as mean  $\pm$  SD from triplicate samples passed through the  $10 \mu\text{L min}^{-1}$ ;  $25 \mu\text{m}$  high channel.

	MSC [%]	MG63 [%]	L929 [%]	HaCaT [%]
TCP Ctrl	96.9 $\pm$ 2	97.0 $\pm$ 4	96.5 $\pm$ 3	95.7 $\pm$ 2
Flow Ctrl	93.6 $\pm$ 3	97.7 $\pm$ 2	97.3 $\pm$ 2	96.9 $\pm$ 1
400 mV	-	96.3 $\pm$ 3	97.6 $\pm$ 2	96.7 $\pm$ 2
800 mV	-	-	96.3 $\pm$ 3	93.7 $\pm$ 4



**Figure S 4.** Cell count data at three time points for MSCs (a), MG63 (b), L929 (c) and HaCaT (d).

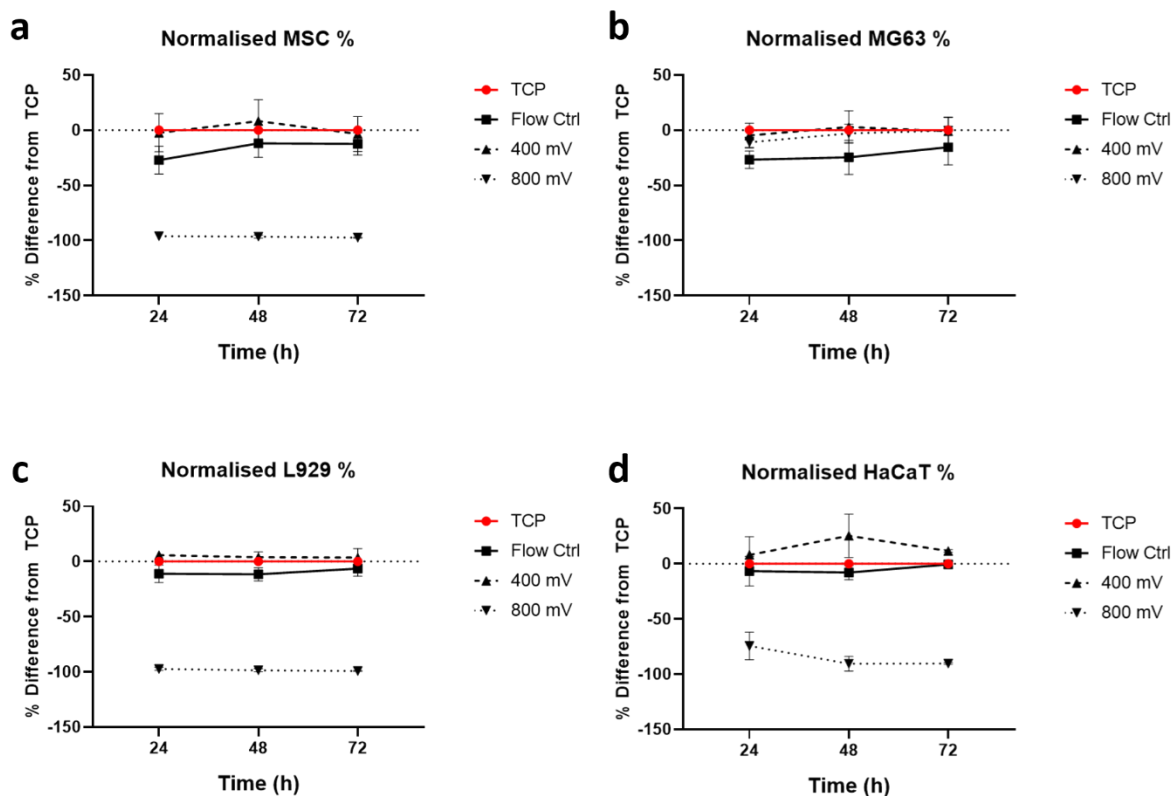
**Table S 2.** Quantification of 24 h live cell percentage calculated from live/dead fluorescence staining, with data presented as mean  $\pm$  SD from triplicate samples passed through the 10  $\mu\text{L min}^{-1}$ ; 50  $\mu\text{m}$  high channel.

	MSC [%]	MG63 [%]
TCP Ctrl	97.1 $\pm$ 4	97.7 $\pm$ 2
Flow Ctrl	95.9 $\pm$ 3	96.4 $\pm$ 4
400 mV	95.3 $\pm$ 5	97.3 $\pm$ 3
800 mV	7.03 $\pm$ 6	95.6 $\pm$ 5

**Table S 3.** Quantification of 24 h live cell percentage calculated from live/dead fluorescence staining, with data presented as mean  $\pm$  SD from triplicate samples passed through the 5  $\mu\text{L min}^{-1}$ ; 25  $\mu\text{m}$  high channel.

	L929 [%]	HaCaT [%]
TCP Ctrl	97.7 $\pm$ 3	95.7 $\pm$ 4
Flow Ctrl	96.7 $\pm$ 3	95.3 $\pm$ 2
400 mV	96.2 $\pm$ 4	93.7 $\pm$ 3
800 mV	-	94.2 $\pm$ 4





**Figure S 5.** Percentage difference in cell metabolic activity normalised to TCP for MSC (a), MG63 (b) based on results reported in Figure 6a and b (at  $10 \mu\text{L min}^{-1}$  in a  $50 \mu\text{m}$  channel height) and for L929 (c) and HaCaT (d) based on results reported in Figure 6c and d (at  $5 \mu\text{L min}^{-1}$  in a  $25 \mu\text{m}$  channel height).

**Table S 4.** Normalised range of metabolic activity highlighting the decreasing trend in range as cell stiffness increases (as shown in Figure 8a) based on results reported in (Figure S5) at a 400 mV acoustic exposure at 72 h.

	MSC [%]	MG63 [%]	L929 [%]	HaCaT [%]
<b>Min</b>	-18.18	-15.45	-1.49	10.19
<b>Max</b>	13.37	7.13	13.04	12.50
<b>Range</b>	31.55	22.57	14.53	2.31