Supplementary Material (ESI) for Lab on a Chip

Supplementary Fig 1. Block diagram of the circuit for Braille device control and power management. The Universal Serial Bus (USB) controller runs a user program that communicates with a personal computer (PC) and sends signals to the high voltage switch array in the Braille display. A user can communicate with the controller using either the PC via USB, or the user interface switches without a PC. The battery management circuit receives power from USB, charges a one-cell Lithium-ion battery, and distributes the power to the other circuits. When the USB is disconnected, the battery charge is stopped and the power source is switched from the USB bus power to the Lithium-ion battery. The user interface and control circuit board is packaged in a 75mm × 60mm × 20mm box.

Supplementary Fig 2. Long-term maintenance-free cell culture in microfluidic channels (300-μm width, rectangular sidewalls). The top-left and bottom-left of the bent channels are upstream and downstream, respectively. A picture of C2C12 at the 16th day has different ROI: the bottom-left part of the other pictures in which the cells were more weakened. In all cultures, cells were seeded at Day 0. Culture media (2 ml per one channel) were not changed during culture. Actual recording rate was 10 min/frame. The growth media used were the modified formulation of DMEM and L15 (1:1) for C2C12, and the modified formulation of MEM α and L15 (1:1) for MC3T3-E1.

Supplementary Fig 3 (video). Time-lapse recording of the culture shown in Fig.2C. The lower is the 15μm-height channel, and the upper the 30μm-height channel. Both recordings start at the time immediately after changing the medium to the

differentiation medium. The recording interval was 10 min / frame. Pulsatile pumping with the COO, COC, OCC, CCO (O:open, C:closed) pattern of Braille pin actuation at 1 Hz refresh rate was used. Culture medium (differentiation medium containing 2% horse serum) was not replaced nor added during this recording.

Supplementary Fig 4. Phase contrast image of murine bone marrow cells seeded in a microfluidic device with a modified Braille setup and an inverted microscope (TS100F; Nikon). This Braille setup is adapted to inverted microscopes by enabling placement of objective lenses under the transparent heater unit. A 10x objective (CFI Achromat ADL; Nikon) and a CMOS machine vision camera (PL-A741; Pixelink) were used for imaging. Although the top-view layout of the channel shown in this picture is different from the layout shown in Fig.1B, the configuration of PDMS layers is the same.