Supplementary Methods

Subjects
21 right-handed subjects (12 male, 9 female, aged 24 ± 3.4 years) gave written informed consent to participate in the study and were naïve to its purpose. The study was conducted in accordance with the Declaration of Helsinki and the methodology had been approved by the local Ethics committee.

Transcranial Magnetic Stimulation (TMS)
Focal TMS with a figure-of-eight coil (Magstim Comp., Dyfed, UK; diameter of each coil was 7 cm) was used to elicit motor evoked potentials in the first dorsal interosseous (FDI) muscle of the relaxed right hand. The motor evoked potentials were recorded with surface electrodes. The coil was kept tangential to the head with orientation approximately perpendicular to the central sulcus of the dominant left cortex (45 degrees from the anterior-posterior axis). The handle pointed posteriorly to minimise the intensity needed for stimulation of primary motor cortex and to avoid current spread to the primary sensory cortex. The intensity was set to the stimulator output that was just sufficient to induce the desired effect of delaying the execution of a finger lift (122 – 143 % of individual resting motor thresholds). The intensity was determined during a practice block preceding the experimental session.

Cutaneous stimulation
Brief electrical cutaneous stimuli were generated by an electrical nerve stimulator (Stanmore stimulator, research device designed and developed by the medical physics department, UCL, London, UK) and applied to left and right index fingers simultaneously using stainless steel ring electrodes (SLE Ltd., Surrey, UK). The stimulus intensity was varied by modulating the pulse width between 0.02 and 0.9 ms while the current intensity was kept constant at 10 mA.

Experimental procedure
Subjects were seated in a comfortable chair with both their arms resting on a table in front of them. Throughout the experiment, subjects had to fixate on a marker placed on the wall approx 2m in front of them and vision to the hands was occluded by a box covering the subjects’ forearms and hands. On each trial, subjects experienced brief cutaneous stimuli applied simultaneously to the left and right index finger. Stimulus intensity to the left finger was set to a fixed pulse width, while the pulse width of stimuli applied to the right finger was varied between trials. A two alternative force-choice paradigm was used in which subjects had to report which of the two stimuli felt stronger. While the left finger always remained at rest and the stimulus intensity was kept constant (150 % of its detection threshold determined prior to the experiment), stimuli intensity to the right finger was varied over the trials to find the level of perceived subjective equality (PSE). The next stimulus intensity for each condition was chosen from a uniform random distribution bounded by the 1 % and 99 % points on the fitted psychometric logistic curve.

Five conditions (Fig. 1) were performed in a pseudo-random order with a total of 250 trials (50 trials per condition). Each trial started with a voice instruction played through loudspeakers instructing the subject whether or not to move the right finger in response to three consecutive tones played at 1 s intervals. In those trials where the subjects remained at rest, the cutaneous stimuli were applied at random times within a time window of 150 ms after the third tone (“resting” condition) or 70 ms after a single TMS pulse was applied simultaneously with the third tone (“resting, post-TMS” condition).
In trials where subjects were instructed to lift their right index finger, the movement had to be initiated within a 150 ms time-window after the third tone. Movement onset was monitored using an Optotrak 3020 optical infrared tracking system (Northern Digital, Waterloo) and subjects were informed if their movement occurred too early or too late and had to repeat the trial. In the “movement” condition the cutaneous stimuli were triggered by the movement onset using the signal from the Optotrak sensor. In the “post TMS delay” condition, movement onset was delayed by a TMS pulse applied on the third tone and the cutaneous stimuli were delivered 70 ms after the TMS pulse during the silent period following the MEP. In the “pre-movement” condition (5 subjects) the cutaneous stimuli were given prior to movement onset in order to match the temporal proximity of the cutaneous stimuli to the delayed movement. The latter was achieved by only including those trials in the analysis in which movement occurred 50 – 120 ms after the cutaneous stimuli.

Applying a single TMS pulse to M1 will inevitably have effects on nearby S1, notably tactile masking. The precise amount of masking depends on underlying brain anatomy and coil placement, which varies from subject to subject. We optimised coil placement for the motor delay effect, and retrospectively identify subjects where severe masking had obviously occurred during the experiment. Our criterion to exclude subjects for this reason was an amount of attenuation due to TMS alone that exceeded the amount of attenuation seen during movement. Seven subjects were excluded who had strong masking due to TMS. An additional 4 subjects were excluded from analysis for other reasons. Of these, 2 were unable to perform precisely timed finger movements and 2 showed almost no sensory suppression during movement.

Data analysis
For each condition, the subjects’ responses (left or right stimulus perceived stronger) were fitted with a logistic function according to a maximum-likelihood procedure and the threshold was calculated to estimate the stimulus intensity applied to the right finger that would make the two cutaneous stimuli perceptually equal. The values for the level of perceived subjective equality (PSE) were pooled for each condition and normalised to the rest condition. Statistical comparisons were made between conditions using two-tailed paired t-tests.