METHODS

**GSR-recording device.**

In electrical terms, the skin can be modeled as a series of parallel resistors whose conductivity (or inverse resistance) increases with secretion of sweat. Because resistances are hard to measure using a microcontroller, the measuring device is based on a voltage divider, where R1 is a fixed resistor and R2 represents the skin. Custom-built electrodes were fabricated from 5-Rappen coins, which were selected because of their high ratio of highly conductive copper (92 %). An Arduino Uno \cite{arduino} microcontroller was connected to the voltage divider, supplying 5 Volts to R2 and the node between R1 and R2 was connected to a 10-bit analog-to-digital converter (ADC). Thus, the measured values range from 1023 (short circuit) to 0 (open circuit). To balance the tradeoff between sensitivity and dynamic range, we selected R1 for each individual subject such that the baseline input value was in the vicinity of 600. Typically, resistors between 100 kOhm and 1 MOhm were used.

The Arduino Uno was programmed to interface with MATLAB, providing samples at a rate of about 65 Hz.

\begin{figure}

\includegraphics{GSR\_device.png}

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\caption{Arduino-based GSR recording device.}

\end{figure}

**GSR-processing and analysis (Jannis)**

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**Experimental design**

The behavioral experiment was based on Iglesias et al \cite{Iglesias2013} and consists of two blocks à 150 trials each. Each trial consisted of a binary visual cue shown for 400 ms, 1200 ms response time, 1000 ms auditory stimulus presentation and a variable inter-trial-interval of 1000 ms \pm 500 ms. Cues and cue-stimulus contingencies were governed by the following probabilities:

Every 30 trials, the (?) changed in a discrete fashion in the following order: 0.9, 0.1, 0.5, 0.7, 0.3, adding up to a total of 5\*30 = 150 trials per block. Importantly, the two blocks differed solely in the nature of the auditory stimulus: a neutral 200 Hz tone in the first block and an aversive white noise tone in the second block.

**Experimental procedure**

*Initialization*. First, subjects were handed an individual sheet containing instructions (see Appendix) and a brief questionnaire, which they were instructed to start filling out. To guarantee their anonymity with respect to data analysis, subjects were first asked to pick an ID from an envelope and write it on their sheet. Next, any remaining questions as to the experimental procedure were answered, ensuring that no participant was told how or when the predictive strengths of the cues would change. Finally, to improve motivation, subjects were told that they would receive a performance-dependent compensation of 4 Rappen per correct trial, i.e., a maximum of 12 CHF.

*GSR recording*. Electrolyte gel was applied to two spots on the participants’ left hand and custom-made GSR electrodes were thoroughly mounted using medical tape. The data was recorded using a custom-written MATLAB \cite{mathworks?} interface specifically designed to sample GSR data at an effective sampling frequency of around 65 Hz.

*Stimulus amplitude calibration*. Before starting the experiment, the amplitude of the aversive stimulus was calibrated for each participant individually to maximize comparability. To this end, subjects were fitted with over-ear headphones, presented with a randomized sequence of the aversive white noise stimulus of 1000 ms duration at different amplitudes and were asked to rate each one on a painfulness scale from 0 (harmless) to 100 (pain threshold). Subsequently, the stimulus amplitude corresponding to 90 % of their individual pain threshold was extrapolated, presented to the participant for approval, and adjusted if necessary.

*Experiment*. Subjects sat in front of a screen with their left hand laying on the table (and being recorded from) and their right middle and index fingers on a keyboard to provide behavioral output. Presentations of cues and stimuli as well as recordings of behavioral and physiological data were carried out in MATLAB. (Supplementary Video?)

**HGF analysis**