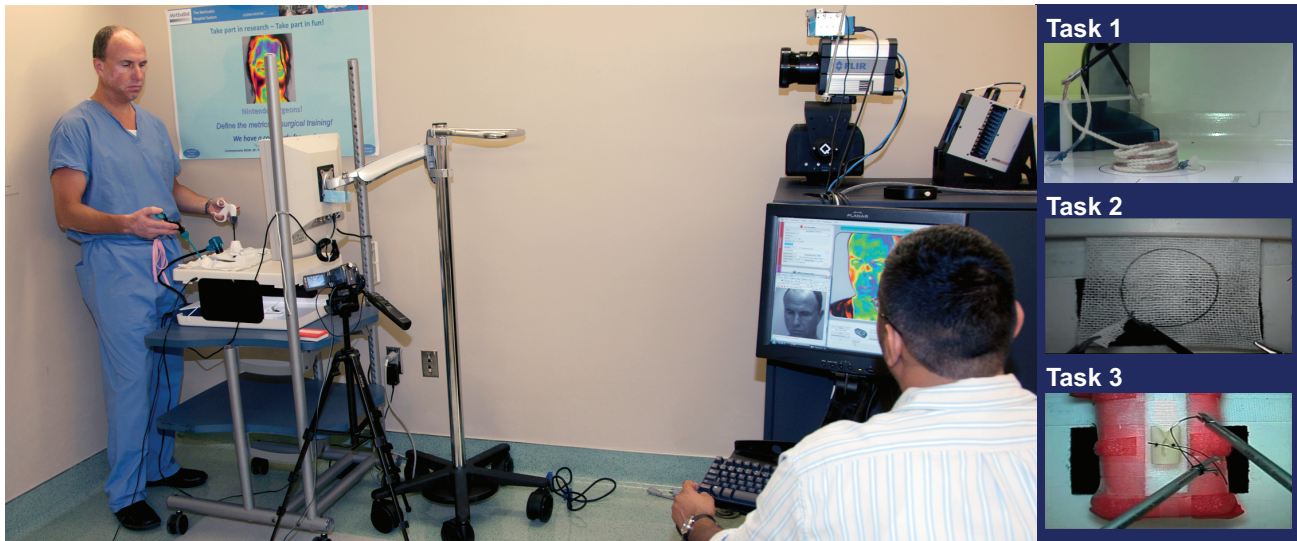


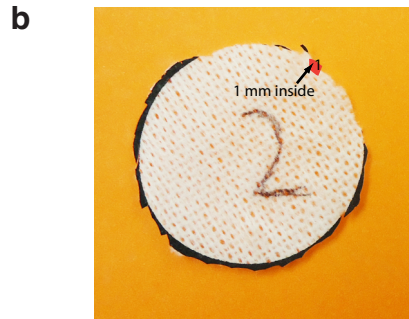
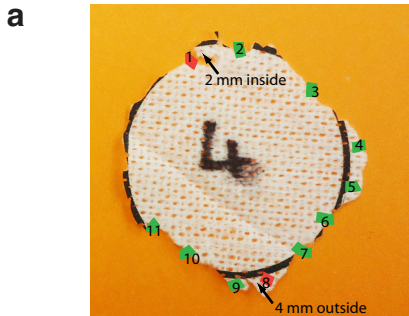
Fast by Nature – How Stress Patterns Define Human Experience and Performance In Dexterous Tasks

I. Pavlidis, P. Tsiamyrtzis, D. Shastri, A. Wesley, Y. Zhou, P. Lindner,
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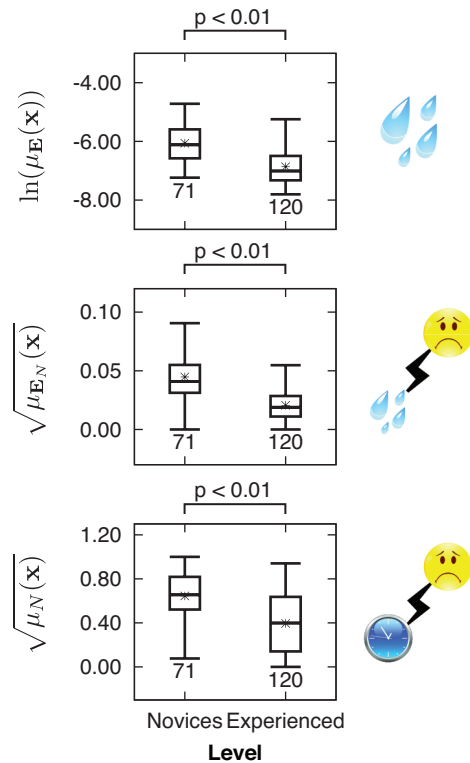
Supplementary Figures and Link to Videos



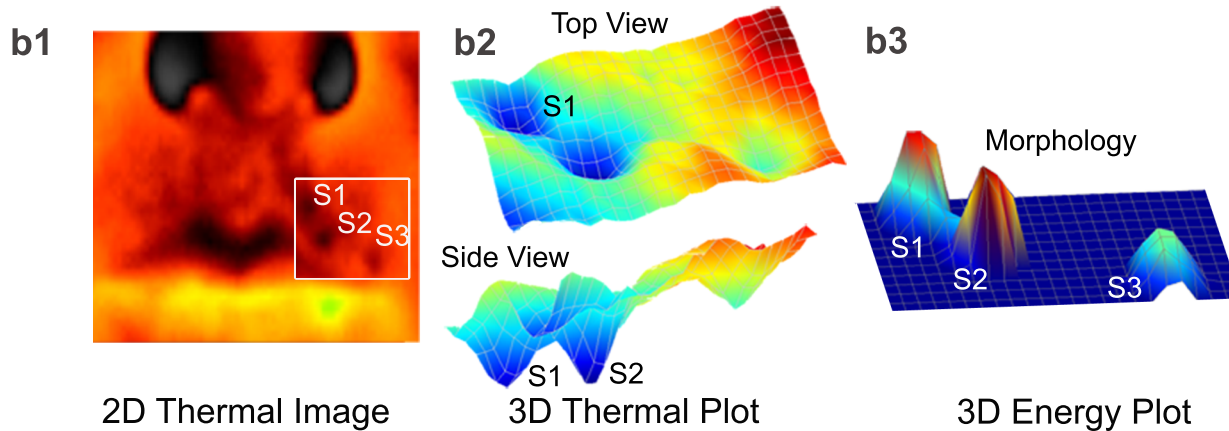
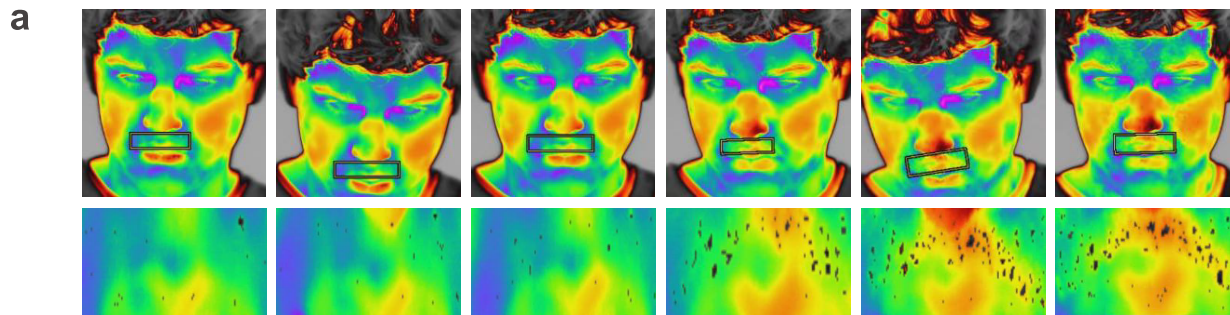
Supplement - Figure S1: Surgeon imaged thermally and visually during trial execution in the inanimate laparoscopic skills lab of the Methodist Institute for Technology, Innovation, and Education (MITIESM). The panels to the right of the figure show details inside the surgical training box during the execution of the three different tasks.



Supplement - Figure S2: Gauze samples from execution of Task 2, with major errors marked in red and minor errors in green. a, Novice surgeon D027 – two major errors recorded by the surgical educator: deepest cuts 2 mm inside and 4 mm outside. A detailed error count yields 9 additional minor errors (total of 11 errors), which the standard grading protocol ignores. b, Experienced surgeon D011 – one major error recorded by the surgical educator: deepest cut 1 mm inside. A detailed error count yields no additional minor errors.



Supplement - Figure S3: Distribution per skill level of mean stress responses $\mu_{\mathbf{E}}(\mathbf{x})$ ($\ln(\cdot)$ transformation), mean stress responses during expressed negative feelings $\mu_{\mathbf{E}_N}(\mathbf{x})$ ($\sqrt{\cdot}$ transformation), and mean extent of expressed negative feelings $\mu_N(\mathbf{x})$ ($\sqrt{\cdot}$ transformation). $\ln(\mu_{\mathbf{E}}(\mathbf{x}))$ is -6.0626 ± 0.6926 (s.d.) for novices and -6.8614 ± 0.6319 (s.d.) for experienced surgeons. $\sqrt{\mu_{\mathbf{E}_N}(\mathbf{x})}$ is 0.0447 ± 0.0204 (s.d.) for novices and 0.0205 ± 0.0169 (s.d.) for experienced surgeons. $\sqrt{\mu_N(\mathbf{x})}$ is 0.6457 ± 0.2279 (s.d.) for novices and 0.3963 ± 0.2928 (s.d.) for experienced surgeons.



Supplement - Figure S4: **a**, First Image Row: Virtual tissue tracker (black rectangle) at work as a subject exhibits head motion during execution of Task 3. Second Image Row: Motion-corrected peri-nasal area snapshots throughout the performance period. The end effect could be considered virtual tethering of a virtual probe, so that the measurement area remains as consistent as in conventional measurements with tethered physical probes. **b1**, Thermal image of the face. Spots S1, S2, and S3 are ‘cold’ spots indicative of perspiration. **b2**, 3D thermal plot of the area surrounding perspiration spots S1, S2, and S3. The conic shape of the spot profiles denotes the gradual transition from a ‘cold’ core to a ‘hot’ surrounding background. **b3**, Outcome of the morphological extraction algorithm as 3D energy plot.

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Link to Videos and Other Online Material

The authors have posted selected visualization clips and the full lab log of the experiments at: <http://www.cpl.uh.edu/other/stresspaper/>

The clips vividly provide a dynamic view of the physiological and observational information upon which the study was based. This dynamic view is difficult to be conveyed through the static form of a manuscript.

It is instructive to watch the three representative video clips (one for each task) from inside the surgical box at the bottom of the web page. Of particular interest is the last clip that depicts a subtask of Task 3, where an experienced surgeon ties the knot in a single attempt, while the novice surgeon engages in many unsuccessful (and fast) attempts before he eventually succeeds.

The lab log is an exhaustive account of the data recording and handling operation during the longitudinal experiment. The actual data (inventories, thermal – visual streams and the extracted signals) amount to tera-bytes. They are available to interested labs upon request.