**Table S1**. High-resolution respirometry was performed using an Oroboros Oxygraph-2K (Oroboros Instruments, Austria), which enables interrogation of mitochondrial function in intact tissue. Following dissection, 2 mg of prefrontal cortex and hippocampus was quickly weighed and transferred into calibrated Oxygraph-2K chambers containing MiR05 respiration medium. Following saponin permeabilization, the final substrate-inhibitor-uncoupled titrations were employed. Injections were performed in the same order as listed here. Oxygen concentration and oxygen flux per tissue mass (pmol O2.s−1·mg−1) were recorded using DatLab software Oroboros Instruments, Austria).

| **Substrates** | **Final Concentration** | **Function** |
|---|---|---|
| Saponin | 20 mM | Plasma membrane permeabilization |
| Pyruvate | 5 mM | NADH-generating substrate |
| Malate | 2 mM | NADH-generating substrate |
| Glutamate | 10 mM | NADH-generating substrate |
| Adenosine diphosphate (ADP) | 2. 5 mM | Substrate of ADP/ATP translocase (ANT) and ATP synthase |
| Cytochrome C | 10 μM | Test integrity of outer mitochondrial membrane |
| Succinate | 10 mM | Substrate of Complex II |
| Carbonyl cyanide p-trifluoro-methoxyphenyl hydrazone (FCCP) | 1 μM (0. 5μM steps) | Uncoupler and protonophore; induce maximum oxygen flux to determine ET capacity |
| Rotenone | 0. 5 μM | Inhibitor of Complex I and NADH oxidation |
| Antimycin A (Ant) | 2. 5 μM | Inhibitor of Complex III |

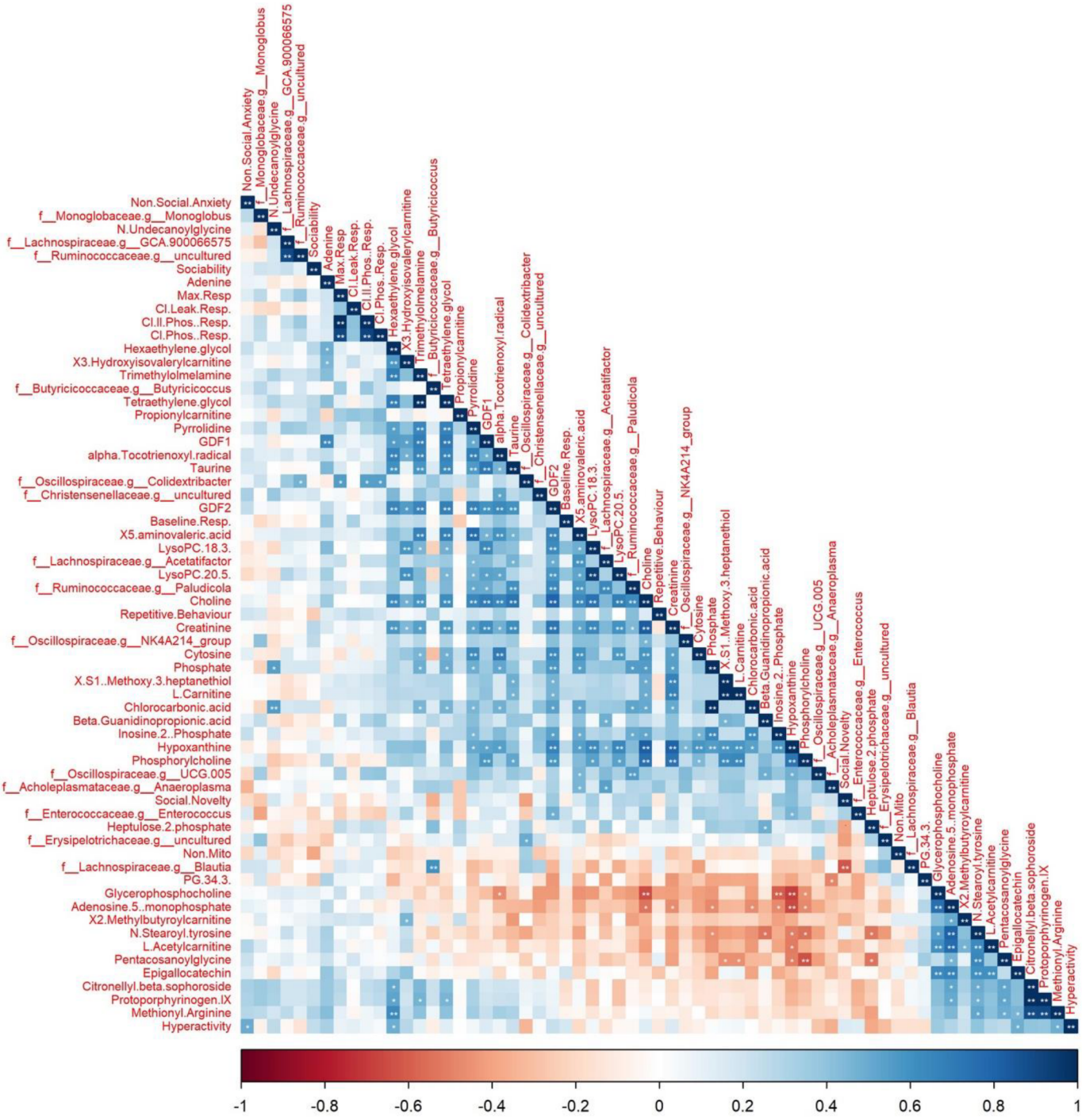


**Figure S1**. Heatmap showing significant correlations between gut microbial, metabolite, mitochondrial respiration, and behavioural data. Box colours represent Pearson's coefficient ($r$) value. *$p < 0.01$, **$p < 0.001$.