Multivariate Meta-Analysis for Longevity and Reproduction

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# Multivariate meta-analysis and meta-regression

Reproductive traits were more strongly impacted by temperature changes than longevity when controlling for temperature (contrast = -1.04, 95% CI: -1.31 to -0.76, df = 396, *p*-value = < 0.0001). At 25C, longevity was reduced by -0.22 SD units relative to the control (95% CI: -0.41 to -0.04, df = 396, *p*-value = 0.02). In contrast, reproduction was significantly reduced by -1.26 SD units relative to the control (95% CI: -1.52 to -1, df = 396, *p*-value = < 0.0001). However, there was high heterogeneity in both traits with prediction intervals spanning -6.35 to 4.12 (**?@fig-fig1**).

Mean effects changed in complicated ways with changes in temperaure, with significant non-linear patterns that depended on the effect outcome (**?@tbl-tbl1**), with effect magnitude and direction changing non-linearly with temperature increases (FAY, MAYBE ADD FIG). Interestingly, studies that observed larger changes in reprodcution also observed correlated changes in longevity (between study correlation = 0.37), however, at the within study-level there was a much weaker correlation (within-study correlation = 0.17, [Figure 1](#fig-fig2)).

| Parameters | Est. | L 95% CI | U 95% CI | df | p-value |
| --- | --- | --- | --- | --- | --- |
| Longevity (mean) | -0.0903 | -0.3092 | 0.1286 | 392 | 0.42 |
| Reproduction (mean) | -0.4837 | -0.7943 | -0.1732 | 392 | < 0.01 |
| Linear Treatment Temperature (centered) - Longevity | -0.2581 | -0.2875 | -0.2288 | 1,576 | < 0.0001 |
| Linear Treatment Temperature (centered) - Reproduction | -0.0660 | -0.0978 | -0.0342 | 1,576 | < 0.0001 |
| Quadratic Treatment Temperature (centered) - Longevity | -0.0022 | -0.0042 | -0.0002 | 1,576 | 0.03 |
| Quadratic Treatment Temperature (centered) - Reproduction | -0.0123 | -0.0146 | -0.0099 | 1,576 | < 0.0001 |
| Cubic Treatment Temperature (centered) - Longevity | 0.0005 | 0.0003 | 0.0006 | 1,576 | < 0.0001 |
| Cubic Treatment Temperature (centered) - Reproduction | -0.0001 | -0.0002 | 0.0001 | 1,576 | 0.42 |

**?(caption)**

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| --- |
| Figure 1- Between study correlation for reproduction and longevity |