Appendix C Extending the t statistic to the time domain

The 1D t statistic is assembled simply by computing the 0D t statistic separately at each time point q. Since all 1D t statistic definitions are therefore trivial extensions of their 0D definitions to the 1D domain q, they are listed here only for completeness. The t statistic continua for the one-sample, paired and two-sample designs are respectively:

$$t(q) = \frac{\overline{y}(q)}{s_1(q)/\sqrt{J}}$$

$$t(q) = \frac{\overline{\Delta y}(q)}{s_p(q)/\sqrt{J}} \tag{C.1}$$

$$t(q) = \frac{\Delta \overline{y}(q)}{s_2(q)\sqrt{\frac{1}{J_A} + \frac{1}{J_B}}}$$

For regression against a continuous independent variable x, the model is:

$$y(q) = \beta_1(q)x + \beta_0(q) + \varepsilon(q)$$

where β_1, β_0 and ε are the slope, intercept and prediction error, respectively. Least-squares estimates of the slope and intercept (denoted $\hat{\beta}_1$ and $\hat{\beta}_0$, respectively) produce the following prediction for the jth response:

$$\hat{y}_j(q) = \hat{\beta}_1(q)x_j + \hat{\beta}_0(q)$$

and the standard error is:

$$s_\beta(q) = \frac{\sqrt{\frac{1}{J-2}\sum(y_j(q) - \hat{y}_j(q))^2}}{\sum(x_j - \overline{x})^2}$$

Finally, the regression t statistic is:

$$t(q) = \frac{\hat{\beta}_1(q)}{s_\beta(q)} \tag{C.2}$$