Confidence Interval for $\psi_1 = -3\mu_1 + 2\mu_2 - 3\mu_3 + 2\mu_4 + 2\mu_5$

Formula: $L_1 - t_{a/2} \frac{MS_{\text{error}}}{\sqrt{n_j}} \sum_{j=1}^{p} \frac{a_{ij}^2}{n_j} < \psi_1 < L_1 + t_{a/2} \frac{MS_{\text{error}}}{\sqrt{n_j}} \sum_{j=1}^{p} \frac{a_{ij}^2}{n_j}$

Some intermediate computations:

$t_{0.0625, 35} = 2.63341$

$L_1 = -3\bar{x}_1 + 2\bar{x}_2 - 3\bar{x}_3 + 2\bar{x}_4 + 2\bar{x}_5$

$L_1 = -3(4) + 2(10) - 3(11) + 2(24) + 2(29) = 81$

$MS_{\text{error}} \sum_{j=1}^{p} \frac{a_{ij}^2}{n_j} = 32 \left( \frac{9}{8} + \frac{4}{8} + \frac{9}{8} + \frac{4}{8} + \frac{4}{8} \right) = 120$

Now substitute these values into the following formula.

$L_1 - t_{a/2} \frac{MS_{\text{error}}}{\sqrt{n_j}} \sum_{j=1}^{p} \frac{a_{ij}^2}{n_j} < \psi_1 < L_1 + t_{a/2} \frac{MS_{\text{error}}}{\sqrt{n_j}} \sum_{j=1}^{p} \frac{a_{ij}^2}{n_j}$

$81 - 2.63341 \sqrt{120} < -3\mu_1 + 2\mu_2 - 3\mu_3 + 2\mu_4 + 2\mu_5 < 81 + 2.63341 \sqrt{120}$

$81 - 28.85 < -3\mu_1 + 2\mu_2 - 3\mu_3 + 2\mu_4 + 2\mu_5 < 81 + 28.85$

$52.15 < -3(\mu_1 + \mu_3) + 2(\mu_2 + \mu_4 + \mu_5) < 109.85$

$52.15 < -3(\mu_1 + \mu_3) + 2(\mu_2 + \mu_4 + \mu_5) < 109.85$

$8.69 < (\mu_2 + \mu_4 + \mu_5)/3 - (\mu_1 + \mu_3)/2 < 18.31$

Hence, we are confident that the average time before paw-licks for those in the three groups which received Morphine second is greater than the average time before paw-licks for those in the two groups which received saline second by between 8.69 and 18.31 seconds. A longer time before paw-licks indicates a reduced pain sensitivity.