Data Set: CREB Inhibitor

Background:
Protein synthesis in certain areas of the brain (notably the hippocampus) appears necessary for memory retention. A research examined the effect of CREB, an RNA transcription factor, on memory by administering a CREB inhibitor to a group of rats and saline to a control group. The dependent variable in this case was the amount of freezing after establishing a conditioned fear response. Higher freezing is associated with higher memory retention.

Your Task:
Present these data in either figure or table form and write a short (i.e., one paragraph) synopsis of the analysis.

Here are the data:
Here is the output:

**Unpaired Means Comparison for Freezing**
Grouping Variable: Group
Hypothesized Difference = 0

<table>
<thead>
<tr>
<th></th>
<th>Mean Diff.</th>
<th>DF</th>
<th>t-Value</th>
<th>P-Value</th>
<th>95% Lower</th>
<th>95% Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control, CREB Inhibitor</td>
<td>10.917</td>
<td>17</td>
<td>4.087</td>
<td>.0008</td>
<td>5.281</td>
<td>16.553</td>
</tr>
</tbody>
</table>

**Variance Comparison for Freezing**
Grouping Variable: Group
Hypothesized Ratio = 1

<table>
<thead>
<tr>
<th></th>
<th>Var. Ratio</th>
<th>Num. DF</th>
<th>Den. DF</th>
<th>F-Value</th>
<th>P-Value</th>
<th>95% Lower</th>
<th>95% Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control, CREB Inhibitor</td>
<td>1.626</td>
<td>8</td>
<td>9</td>
<td>1.626</td>
<td>.4944</td>
<td>.396</td>
<td>7.084</td>
</tr>
</tbody>
</table>

**Group Info for Freezing**
Grouping Variable: Group

<table>
<thead>
<tr>
<th></th>
<th>Count</th>
<th>Mean</th>
<th>Variance</th>
<th>Std. Dev.</th>
<th>Std. Err</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>9</td>
<td>48.721</td>
<td>42.449</td>
<td>6.515</td>
<td>2.172</td>
</tr>
<tr>
<td>CREB Inhibitor</td>
<td>10</td>
<td>37.804</td>
<td>26.111</td>
<td>5.110</td>
<td>1.616</td>
</tr>
</tbody>
</table>

**Cell Point Chart**
Grouping Variable(s): Group
Error Bars: ± 1 Standard Error(s)
Sample write up:

Figure 1 depicts the means (plus or minus one standard error) for the control group and the group given the CREB inhibitor. The difference in means was 10.9 units and was highly significant by a t test for two independent groups ( \( t = 4.09, df = 17, p < .001 \)). The pooled within group standard deviation was 5.8, giving an effect size of 1.88. Hence, the CREB inhibitor had a strong effect in inhibiting the conditioned freezing response.

Figure 1. Means (plus and minus one standard error) for freezing response in controls and in subjects administered a CREB inhibitor.

\[
N_1 \text{ is the number of observations in the } i\text{th group and } s_i^2 \text{ is the variance of the } i\text{th group. The pooled within group standard deviation is simply the square root of this quantity.}
\]

NOTES:

(1) The formula for pooling the variance for two groups is

\[
s_{pooled}^2 = s_p^2 = \frac{(N_1 - 1)s_1^2 + (N_2 - 1)s_2^2}{N_1 + N_2 - 2}
\]

where \( N_i \) is the number of observations in the \( i\)th group and \( s_i^2 \) is the variance of the \( i\)th group. The pooled within group standard deviation is simply the square root of this quantity.

(2) An effect size is a quantitative index of the magnitude of an effect. For this example, effect size equals the difference in means divided by the pooled within group standard deviation or 10.8 / 5.8. The result (1.88) denotes that the two groups differ by 1.88 standard deviation units.