Supplementary Methods and Results
Response-Surface Analysis

We used response surface analysis to test for linear and non-linear relationships between a daughter’s weight and her mate’s weight on mate choice, and to test for treatment effects on these relationships. Our approach was the same for both pre-copulatory choice (latency to mounting) and post-copulatory choice (number of eggs).

Methods

We investigated whether there were differences in daughter’s mate choice with regard to treatment using the sequential model building procedure described by Draper & John (1988) and Chenoweth & Blows (2005). To do this we constructed a reduced model that included only the treatment effect, the family within treatment effect and the two linear covariates, daughter’s weight and her mate’s weight:

\[ M = \beta_0 + \alpha_0 T + \alpha_0 F(T) + \sum_{i=1}^{n} \beta_i C_i + \epsilon \]  

(1)

Where \( M \) was the response measure, \( \beta_0 \) was the intercept term, \( \alpha_0 T \) was the effect of treatment, \( \alpha_0 F(T) \) was the effect of family within treatment, \( n \) was the number of covariates in the model, each \( \beta_i \) was the linear gradient describing the effect of covariate \( C_i \), and \( \epsilon \) was the unexplained error.

We then constructed a new (complete) model that included all of the terms in equation (1) plus the interactions between the linear terms and treatment:

\[ M = \beta_0 + \alpha_0 T + \alpha_0 F(T) + \sum_{i=1}^{n} \beta_i C_i + \sum_{i=1}^{n} \alpha_i C_i T + \epsilon \]

(2)

where each \( \alpha_i \) is the effect of the interaction between treatment and the covariates \( (C_i) \).

To test whether the addition of the interaction terms significantly affected the explanatory power of our model we compared the unexplained sums of squares (SSr) of the reduced model (1) to the unexplained sums of squares (SSc) of the complete model (2) using a partial F-test (1990):
\[ F_{a,b} = \frac{(SS_r - SS_c)}{a} / \frac{SS_c}{b} \]  

(3)

where \( a \) is the number of terms that differ between the reduced and complete model, and \( b \) is the degrees of freedom for SS\( c \).

To test whether the effect of the quadratic covariates differed between daughters sired by attractive and unattractive males the SS\( r \) from the reduced model containing all terms from equation (1) plus the quadratic covariates,

\[ M = \beta_0 + \alpha_0 T + \alpha_0 F(T) + \sum_{i=1}^{n} \beta_i C_i + \sum_{i=1}^{n} \alpha_i C_i T + \sum_{i=1}^{n} \beta_i C_i^2 + \varepsilon \]  

(4)

was compared to the SS\( c \) of the complete model, containing the interactions between the quadratic effects and treatment,

\[ M = \beta_0 + \alpha_0 T + \alpha_0 F(T) + \sum_{i=1}^{n} \beta_i C_i + \sum_{i=1}^{n} \alpha_i C_i T + \sum_{i=1}^{n} \beta_i C_i^2 + \sum_{i=1}^{n} \alpha_i C_i^2 T + \varepsilon \]  

(5)

using (3).

Finally to test whether the effect of the correlational term differed between treatments the SS\( r \) from the reduced model, containing all terms from equation (5) plus the correlational term

\[ M = \beta_0 + \alpha_0 T + \alpha_0 F(T) + \sum_{i=1}^{n} \beta_i C_i + \sum_{i=1}^{n} \alpha_i C_i T + \sum_{i=1}^{n} \beta_i C_i^2 + \sum_{i=1}^{n} \alpha_i C_i^2 T + \sum_{i=1}^{n} \sum_{j=1}^{n} \beta_i C_i C_j + \varepsilon \]  

(6)

was compared to the SS\( c \) of the complete model, containing the interaction between treatment and the correlational term,
\[ M = \beta_0 + \alpha_0 T + \alpha_0 F(T) + \sum_{i=1}^{n} \beta_i C_i + \sum_{i=1}^{n} \alpha_i C_i T + \sum_{i=1}^{n} \beta_i C_i^2 + \sum_{i=1}^{n} \alpha_i C_i T + \sum_{i=1}^{n} \sum_{j=1}^{n} \beta_{ij} C_i C_j + \sum_{i=1}^{n} \sum_{j=1}^{n} \alpha_{ij} C_i C_j T + \varepsilon \]  

using (3).

Results

The addition of the interaction between treatment and the correlational term improved the explanatory power for both latency to mounting and the number of eggs (Table S1). Our final models for both latency to mount and number of eggs therefore included all main effects and the correlational by treatment interaction

Table S1. Partial F-tests assessing whether the addition of treatment interactions with linear, quadratic and correlational terms increases the explanatory power of our models.

<table>
<thead>
<tr>
<th>Test</th>
<th>Time to mounting</th>
<th>Number of eggs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SSr</td>
<td>SSc</td>
</tr>
<tr>
<td>Treatment*linear interactions (1) vs. (2)</td>
<td>6.504E+05</td>
<td>6.499E+05</td>
</tr>
<tr>
<td>Treatment*quadratic interactions (4) vs. (5)</td>
<td>6.483E+05</td>
<td>6.444E+05</td>
</tr>
<tr>
<td>Treatment*correlational interaction (6) vs. (7)</td>
<td>6.470E+05</td>
<td>6.399E+05</td>
</tr>
</tbody>
</table>

References
