Table S1. Biomechanical Properties of Femur

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>p-value</th>
<th>Male</th>
<th>Female</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>BK^KO</td>
<td></td>
<td>Control</td>
<td>BK^KO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of animals</td>
<td>p-value</td>
<td></td>
<td>Number of animals</td>
<td>p-value</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>13</td>
<td>10</td>
<td></td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><strong>Whole Bone Mechanical Properties</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Yield Load (N)</td>
<td>11.09 ± 0.617</td>
<td>7.853 ± 0.584</td>
<td>0.0013</td>
<td>9.880 ± 0.315</td>
<td>5.447 ± 0.711</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Stiffness</td>
<td>102.9 ± 5.35</td>
<td>83.23 ± 7.21</td>
<td>0.0357</td>
<td>62.77 ± 3.45</td>
<td>40.75 ± 4.41</td>
<td>0.0010</td>
</tr>
<tr>
<td><strong>Tissue Level Biomechanics</strong></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Yield Strain</td>
<td>0.016 ± 0.002</td>
<td>0.013 ± 0.001</td>
<td>0.3150</td>
<td>0.023 ± 0.001</td>
<td>0.018 ± 0.002</td>
<td>0.0972</td>
</tr>
<tr>
<td>Post Yield Strain</td>
<td>5.577 ± 0.762</td>
<td>0.392 ± 0.068</td>
<td>&lt; 0.0001</td>
<td>6.425 ± 0.980</td>
<td>0.549 ± 0.154</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Total Strain</td>
<td>0.088 ± 0.006</td>
<td>0.027 ± 0.001</td>
<td>&lt; 0.0001</td>
<td>0.096 ± 0.007</td>
<td>0.033 ± 0.004</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Young's Modulus (MPa)</td>
<td>6166 ± 423</td>
<td>4081 ± 327</td>
<td>0.0013</td>
<td>5178 ± 174</td>
<td>2566 ± 260</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Yield Stress (MPa)</td>
<td>76.36 ± 7.50</td>
<td>47.50 ± 5.60</td>
<td>0.0082</td>
<td>108.0 ± 7.86</td>
<td>42.18 ± 10.64</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Maximum Stress (MPa)</td>
<td>134.10 ± 5.90</td>
<td>70.91 ± 6.28</td>
<td>&lt; 0.0001</td>
<td>160.10 ± 6.30</td>
<td>56.35 ± 6.70</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Failure Stress (MPa)</td>
<td>112.30 ± 7.00</td>
<td>51.88 ± 10.02</td>
<td>&lt; 0.0001</td>
<td>151.00 ± 7.24</td>
<td>53.71 ± 7.50</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Toughness (MPa)</td>
<td>9.449 ± 0.865</td>
<td>1.196 ± 0.123</td>
<td>&lt; 0.0001</td>
<td>12.40 ± 1.052</td>
<td>1.360 ± 0.248</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>CSMOI (mm^4)</td>
<td>0.162 ± 0.008</td>
<td>0.195 ± 0.019</td>
<td>0.0937</td>
<td>0.101 ± 0.005</td>
<td>0.154 ± 0.005</td>
<td>&lt; 0.0001</td>
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</tbody>
</table>

Values are recorded as mean ± SEM. N, number of animals; MPa, megapascals; CSMOI, cross sectional moment of inertia.
Figure S1. Reduction in weight of $BT^{KO}$ adipose tissue. Inguinal and gonadal fat pads were dissected from control (Ctrl, blue) and $BT^{KO}$ (red) mice, blotted, and weighed. Left and right fat pads were dissected from each mouse and the average weight used as the fat pad weight for that mouse. (n=10 for all groups except for $BT^{KO}$ males, for which n=13).
Figure S2. $BT^{KO}$ muscle mass is reduced compared to that of controls, proportionate to reduced $BT^{KO}$ body mass. As a representative example of the generalized reduced mass of $BT^{KO}$ muscle, compared to controls, quadriceps were dissected out, blotted and weighed. Left and right quadriceps were dissected from male mice and the average weight used as the quadriceps weight for that mouse. Controls (Ctrl), $n=10$, and $BT^{KO}$, $n=11$. Bottom panel shows the reduction in mass of $BT^{KO}$ quadriceps to be proportionate to the reduced mass of mice $BT^{KO}$ mice themselves, by dividing the averaged weights of the quadriceps of each mouse by the weight of that mouse.
Figure S3. Some $BT^{KO}$ mice showed flaring of proximal tibias. A photograph is shown of an example of flaring of the proximal tibia, seen in some $BT^{KO}$ mice.
Figure S4. A portion of $BT^{KO}$ osteocytes seemed unable to maintain the integrity of the lacunae in which they were located. A representative comparison is shown for FITC staining of cortical areas of femur, showing $BT^{KO}$ osteocytes to have a loss of integrity of lacunae, resulting in increased penetration of FITC through lacunae walls (right panel), compared to controls (left panel).
Figure S5. TEM comparison of $BT^{KO}$ and control bone collagen fibrils. Unlike tendon collagen fibrils, bone collagen fibrils are not all parallel, and thus both longitudinal and cross-sections of collagen fibrils are seen in the same images for control (Ctrl) and $BT^{KO}$ electron-micrographs.