**T****h****e** **Bone Biomarker Response to an Acute Bout of Exercise:**

**A Systematic Review with Meta-Analysis**

**Supplementary File 9: Primary meta-analyses and moderator analyses for general bone metabolism**

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|  | **Summary of findings** | | | **Evidence Certainty** | | | | |
| **Outcome (#/n)** | **Effect size**  **Median [95% CrI]** | **Between study standard error ()**  **Median [75% CrI]** | **ICC**  **Median [75% CrI]** | **D1**  **Risk of Bias** | **D2**  **Directness** | **D3**  **Inconsistency** | **D4**  **Imprecision** | **D5**  **Small-study Effects** |
| All biomarkers exercise  (tOC: 226; Osteopontin: 2)  228 outcomes / 42 studies | 0.04 [0.00 to 0.09] | 0.09 [0.07 to 0.11] | 0.30 [0.11 to 0.47] | High | Moderate | Low | Low | Low |
| tOC  226 outcomes / 42 studies | 0.04 [0.00 to 0.08] | 0.08 [0.06 to 0.10] | 0.26 [0.09 to 0.44] | High | Moderate | Low | Low | Low |
| All biomarkers Control  35 outcomes / 10 studies  (tOC:35) | -0.03 [-0.14 to 0.12] | 0.11 [0.06 to 0.17] | 0.20 [0.04 to 0.58] | High | High | Moderate | Moderate | Moderate |
| **Moderator analysis tOC only** | | | | | | | | |
| **Timing** | | | | | | | | |
| (Immediately - 8 hours post)  159 outcomes / 39 studies | 0.05 [0.00 to 0.11] | 0.10 [0.07 to 0.12] | 0.30 [0.12 to 0.52] | High | Moderate | Low | Low | Low |
| (Immediatel­­­­y - 15min post)  68 outcomes / 30 studies | 0.06 [0.00 to 0.13] | 0.17 [0.13 to 0.20] | 0.07 [0.02 to 0.22] | High | Moderate | Low | Low | Low |
| (> 15 min, ≤ 2 hours post)  56 outcomes / 27 studies | 0.05 [-0.01 to 0.13] | 0.08 [0.05 to 0.11] | 0.14 [0.03 to 0.43] | High | Moderate | Low | Low | Low |
| (> 2 hours, ≤ 8 hours post)  35 outcomes / 11 studies | -0.08 [-0.20 to 0.04] | 0.08 [0.04 to 0.12] | 0.55 [0.22 to 0.85] | High | Very Low | Very Low | Very Low | Very Low |
| 24 hours post  37 outcomes / 17 studies | -0.01 [-0.10 to 0.08] | 0.04 [0.02 to 0.07] | 0.49 [0.13 to 0.83] | High | Very low | Very Low | Very Low | Very Low |
| 48 hours post  13 outcomes / 8 studies | 0.01 [-0.16 to 0.17] | 0.09 [0.04 to 0.15] | 0.34 [0.08 to 0.76] | High | Moderate | Low | Low | Low |
| 72 hours post  12 outcomes / 8 studies | 0.05 [-0.11 to 0.22] | 0.07 [0.03 to 0.13] | 0.41 [0.10 to 0.81] | High | Moderate | Low | Very Low | Very Low |
| **Exercise Type** | | | | | | | | |
| Aerobic  167 outcomes / 33 studies | 0.05 [0.00 to 0.12] | 0.12 [0.09 to 0.14] | 0.24 [0.09 to 0.42] | High | Moderate | Low | Low | Low |
| Plyometric  25 outcomes / 5 studies | -0.02 [-0.14 to 0.10] | 0.05 [0.02 to 0.10] | 0.44 [0.11 to 0.83] | High | High | Moderate | Moderate | Moderate |
| Resistance  11 outcomes / 4 studies | 0.04 [-0.33 to 0.47] | 0.16 [0.07 to 0.30] | 0.22 [0.04 to 0.66] | High | High | Moderate | Low | Low |
| **Impact level** | | | | | | | | |
| Low impact/repetitive  59 outcomes / 14 studies | 0.05 [-0.05 to 0.16] | 0.08 [0.04 to 0.13] | 0.66 [0.30 to 0.91] | Low | Very Low | Very Low | Very Low | Very Low |
| Moderate impact/repetitive  109 outcomes / 21 studies | 0.06 [-0.02 to 0.15] | 0.14 [0.11 to 0.17] | 0.09 [0.02 to 0.20] | High | Moderate | Low | Low | Low |
| Low impact/ high load  18 outcomes / 6 studies | 0.04 [-0.13 to 0.18] | 0.08 [0.04 to 0.14] | 0.30 [0.06 to 0.70] | High | High | Moderate | Moderate | Moderate |
| High impact / directional  28 outcomes / 6 studies | -0.01 [-0.12 to 0.11] | 0.05 [0.02 to 0.09] | 0.50 [0.14 to 0.86] | High | Moderate | Low | Low | Low |
| **Modality** | | | | | | | | |
| Running  92 outcomes / 16 studies | 0.03 [-0.08 to 0.15] | 0.18 [0.14 to 0.22] | 0.02 [0.00 to 0.06] | High | Moderate | Low | Low | Low |
| Cycling  57 outcomes / 13 studies | 0.04 [-0.04 to 0.13] | 0.05 [0.02 to 0.08] | 0.80 [0.46 to 0.95] | Low | Very Low | Very Low | Very Low | Very Low |
| Walking  17 outcomes / 6 studies | 0.13 [-0.12 to 0.40] | 0.15 [0.08 to 0.25] | 0.52 [0.19 to 0.84] | Moderate | Low | Very Low | Very Low | Very Low |
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| **Exercise Characteristics** | | | | | | | | |
| Continuous  142 outcomes / 26 studies | 0.06 [0.00 to 0.14] | 0.10 [0.08 to 0.12] | 0.21 [0.06 to 0.43] | High | Moderate | Low | Low | Low |
| Intermittent  26 outcomes / 8 studies | 0.01 [-0.20 to 0.24] | 0.20 [0.13 to 0.28] | 0.24 [0.08 to 0.53] | High | High | Moderate | Low | Low |
|  |  |  |  |  |  |  |  |  |
| Duration (Per 10 Mins) 164 outcomes / 32 studies | 0.02 [0.00 to 0.04] | 0.09 [0.07 to 0.12] | 0.18 [0.05 to 0.38] | High | Moderate | Low | Low | Low |
| Intensity Low  110 outcomes / 19 studies | 0.04 [-0.03 to 0.13] | 0.09 [0.06 to 0.12] | 0.29 [0.09 to 0.55] | High | Moderate | Low | Low | Low |
| Intensity High  24 outcomes / 8 studies | 0.21 [-0.04 to 0.50] | 0.24 [0.16 to 0.35] | 0.18 [0.05 to 0.45] | Low | Very Low | Very Low | Very Low | Very Low |
| Total work done (Per 1000 units)  144 outcomes / 25 studies | 0.03 [0.01 to 0.07] | 0.08 [0.05 to 0.11] | 0.22 [0.06 to 0.48] | High | Moderate | Low | Low | Low |
| **Participant Characteristics** | | | | | | | | |
| Male  145 outcomes / 24 studies | 0.03 [-0.03 to 0.12] | 0.11 [0.08 to 0.15] | 0.10 [0.03 to 0.25] | High | Moderate | Low | Low | Low |
| Female  65 outcomes / 15 studies | 0.05 [0.00 to 0.12] | 0.04 [0.02 to 0.07] | 0.59 [0.23 to 0.87] | Low | Very Low | Very Low | Very Low | Very Low |
| Mixed: male/female  16 outcomes / 6 studies | 0.03 [-0.19 to 0.27] | 0.13 [0.06 to 0.21] | 0.51 [0.18 to 0.84] | Low | Very Low | Very Low | Very Low | Very Low |
|  |  |  |  |  |  |  |  |  |
| Sedentary  59 outcomes / 10 studies | 0.06 [-0.05 to 0.20] | 0.14 [0.10 to 0.18] | 0.14 [0.03 to 0.34] | High | High | Moderate | Moderate | Moderate |
| Recreational  104 outcomes / 17 studies | 0.00 [-0.05 to 0.05] | 0.04 [0.02 to 0.06] | 0.59 [0.26 to 0.88] | High | Moderate | Low | Low | Low |
| Athlete  51 outcomes / 12 studies | 0.16 [0.01 to 0.36] | 0.20 [0.14 to 0.28] | 0.11 [0.03 to 0.28] | Low | Very Low | Very Low | Very Low | Very Low |

All variables with sufficient data to analyse are presented.