# Supplementary material

**Table S1:** Peak penetration depth (mm) on the glenoid cartilage with location of the contact zone for each exercise (n = 3)\*. Exercises are classified according to their impact on the joint.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Muscle trained** | **Weight (kg)** | **Exercise** | **Location\*\*** | **Mean** | **SD** | ***P* value**† |
| Deltoid | - | Elevation with TheraBand | 3,4 | 1.49 | 0.04 |   |
|  | 10 | Cable Bar Upright Row | 2 | 1.63 | 0.01 | 0.036 |
|   | 2.5 | Dumbbell Lying Rear Delt Row | 2,3 | 1.70 | 0.18 | 0.233 |
| Supraspinatus | - | Elevation with TheraBand | 3,4 | 1.49 | 0.04 |   |
|  | 2 | Cable Seated Front Lateral Raise | 2,3 | 1.50 | 0.01 | 0.707 |
|  | 2.5 | Dumbbell Lateral Raise | 3 | 1.54 | 0.05 | 0.454 |
| Infraspinatus + teres minor | - | Elevation with TheraBand | 3,4 | 1.49 | 0.04 |   |
|  | 2 | Cable Seated Shoulder External Rotation | 2 | 1.52 | 0.06 | 0.431 |
|  | 1 | Dumbbell Seated Shoulder External Rotation | 2 | 1.55 | 0.02 | 0.173 |
|  | body | Inverted row (small amplitude) | 2,3 | 1.59 | 0.12 | 0.390 |
| Subscapularis | 4 | Cable Standing Shoulder Internal Rotation | 3 | 0.21 | 0.21 |   |
|  | - | Internal Rotation with TheraBand | 3 | 0.31 | 0.14 | 0.629 |
|   | 2.5 | Dumbbell Seated Shoulder External Rotation on the Floor | 3 | 1.37 | 0.19 | 0.037 |
| Biceps | 2.5 | Dumbbell Curl | 3 | 0.59 | 0.17 |   |
|  | 8 | Cable Curl | 3 | 0.62 | 0.08 | 0.764 |
|   | body | Chin Up | 3 | 1.34 | 0.06 | 0.017 |
| Triceps | 1 | Dumbbell Kick Back | 3 | 0.34 | 0.35 |   |
|  | 2 | Cable Bent-over Triceps Extension | 4 | 1.48 | 0.06 | 0.032 |
|  | body | Bench Dip | 2 | 1.76 | 0.15 | 0.034 |
| Latissimus dorsi | 4 | Cable Standing Row | 2 | 0.55 | 0.19 |   |
|  | 2.5 | Dumbbell Lying Row | 2 | 1.52 | 0.01 | 0.014 |
| Superior trapezius | 2.5 | Up Shoulder with TheraBand | NA | 0.00 | 0.00 |  -  |
|  | - | Dumbbell Shrug | NA | 0.00 | 0.00 | - |
| Middle + inferior trapezius | 2.5 | Dumbbell Bent-over Row | 2 | 1.36 | 0.06 |   |
|  | body | Inverted Row (large amplitude) | 2 | 1.60 | 0.03 | 0.041 |
|  | 4 | Cable Rowing | 3 | 1.98 | 0.01 | 0.002 |
| Pectoralis | 2.5 | Push-up Dumbbell Bench Press | 3 | 0.42 | 0.14 |   |
|  | body | Push-up | 2,3 | 1.49 | 0.02 | 0.005 |
| Serratus | 2.5 | Dumbbell Incline Shoulder Raise | 4 | 0.76 | 0.05 |   |
|  | 2 | Cable Incline Shoulder Raise | 3 | 1.53 | 0.11 | 0.005 |
|   | body | Incline Push-up | 2,3 | 1.54 | 0.11 | 0.005 |

\* Data are reported for the participant performing three trials for each exercise

\*\* Location of the contact zone around the glenoid according to our documentation (2 = anterosuperior, 3 = superior, 4 = posterosuperior)

† *P* values obtained with use of Student’s *t*-test

**Table S2:** Peak penetration depth (mm) on the labrum with location of the contact zone for each exercise (n = 3)\*. Exercises are classified according to their impact on the joint.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Muscle trained** | **Weight (kg)** | **Exercise** | **Location\*\*** | **Mean** |  **SD** | ***P* value**† |
| Deltoid | - | Elevation with TheraBand | 3,4 | 1.54 | 0.02 |   |
|  | 10 | Cable Bar Upright Row | 2 | 1.57 | 0.04 | 0.257 |
|   | 2.5 | Dumbbell Lying Rear Delt Row | 2,3 | 1.67 | 0.04 | 0.039 |
| Supraspinatus | 2 | Cable Seated Front Lateral Raise | 2,3 | 1.53 | 0.02 |   |
|  | - | Elevation with TheraBand | 3,4 | 1.54 | 0.02 | 0.742 |
|  | 2.5 | Dumbbell Lateral Raise | 3 | 1.57 | 0.02 | 0.032 |
| Infraspinatus + teres minor | - | Elevation with TheraBand | 3,4 | 1.54 | 0.02 |   |
|  | 1 | Dumbbell Seated Shoulder External Rotation | 2 | 1.59 | 0.06 | 0.249 |
|  | body | Inverted row (small amplitude) | 2,3 | 1.61 | 0.15 | 0.521 |
|  | 2 | Cable Seated Shoulder External Rotation | 2 | 1.62 | 0.02 | 0.001 |
| Subscapularis | - | Internal Rotation with TheraBand | 3 | 0.20 | 0.19 |   |
|  | 4 | Cable Standing Shoulder Internal Rotation | 3 | 0.32 | 0.20 | 0.059 |
|   | 2.5 | Dumbbell Seated Shoulder External Rotation on the floor | 3 | 1.02 | 0.16 | 0.003 |
| Biceps | 2.5 | Dumbbell Curl | 3 | 0.41 | 0.14 |   |
|  | 8 | Cable Curl | 3 | 0.52 | 0.07 | 0.283 |
|   | body | Chin Up | 3 | 0.94 | 0.02 | 0.021 |
| Triceps | 1 | Dumbbell Kick Back | 3 | 0.30 | 0.32 |   |
|  | 2 | Cable Bent-over Triceps Extension | 4 | 1.55 | 0.01 | 0.020 |
|  | body | Bench Dip | 2 | 1.72 | 0.12 | 0.018 |
| Latissimus dorsi | 4 | Cable Standing Row | 2 | 0.33 | 0.23 |   |
|  | 2.5 | Dumbbell Lying Row | 2 | 1.64 | 0.05 | 0.013 |
| Superior trapezius | 2.5 | Up Shoulder with TheraBand | NA | 0.00 | 0.00 | - |
|  | - | Dumbbell Shrug | NA | 0.00 | 0.00 | - |
| Middle + inferior trapezius | 2.5 | Dumbbell Bent-over Row | 2 | 1.39 | 0.01 |   |
|  | body | Inverted Row (large amplitude) | 2 | 1.65 | 0.01 | 0.001 |
|  | 4 | Cable Rowing | 3 | 1.80 | 0.02 | 0.001 |
| Pectoralis | 2.5 | Push-up Dumbbell Bench Press | 3 | 0.91 | 0.10 |   |
|  | body | Push-up | 2,3 | 1.42 | 0.09 | 0.038 |
| Serratus | 2.5 | Dumbbell Incline Shoulder Raise | 4 | 0.52 | 0.02 |   |
|  | 2 | Cable Incline Shoulder Raise | 3 | 1.55 | 0.05 | 0.001 |
|   | body | Incline Push-up | 2,3 | 1.67 | 0.07 | 0.001 |

\* Data are reported for the participant performing three trials for each exercise

\*\* Location of the contact zone around the glenoid according to our documentation (2 = anterosuperior, 3 = superior, 4 = posterosuperior)

† *P* values obtained with use of Student’s *t*-test

**Table S3:** Minimal subacromial space height (mm) for each exercise (n = 3)\*. Exercises are classified according to their impact on the joint.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Muscle trained** | **Weight (kg)** | **Exercise** | **Mean** | **SD** | ***P* value**† |
| Deltoid | 10 | Cable Bar Upright Row | 3.60 | 0.43 |   |
|  | - | Elevation with TheraBand | 0.95 | 0.23 | 0.014 |
|   | 2.5 | Dumbbell Lying Rear Delt Row | 0.71 | 0.44 | 0.022 |
| Supraspinatus | 2 | Cable Seated Front Lateral Raise | 1.69 | 0.12 |   |
|  | 2.5 | Dumbbell Lateral Raise | 1.21 | 0.25 | 0.029 |
|  | - | Elevation with TheraBand | 0.95 | 0.23 | 0.012 |
| Infraspinatus + teres minor | body | Inverted row (small amplitude) | 2.73 | 1.38 |   |
|  | 1 | Dumbbell Seated Shoulder External Rotation | 1.56 | 0.16 | 0.243 |
|  | 2 | Cable Seated Shoulder External Rotation | 1.55 | 0.15 | 0.243 |
|  | - | Elevation with TheraBand | 0.95 | 0.23 | 0.130 |
| Subscapularis | - | Internal Rotation with TheraBand | 2.52 | 0.41 |   |
|  | 4 | Cable Standing Shoulder Internal Rotation | 1.98 | 0.33 | 0.018 |
|   | 2.5 | Dumbbell Seated Shoulder External Rotation on the Floor | 1.75 | 0.24 | 0.080 |
| Biceps | 8 | Cable Curl | 1.29 | 0.24 |   |
|  | 2.5 | Dumbbell Curl | 1.18 | 0.11 | 0.648 |
|   | body | Chin Up | 0.45 | 0.27 | 0.077 |
| Triceps | 1 | Dumbbell Kick Back | 2.24 | 0.03 |   |
|  | body | Bench Dip | 1.69 | 0.11 | 0.010 |
|  | 2 | Cable Bent-over Triceps Extension | 0.22 | 0.08 | 0.000 |
| Latissimus dorsi | 4 | Cable Standing Row | 2.07 | 0.15 |   |
|  | 2.5 | Dumbbell Lying Row | 1.50 | 0.05 | 0.030 |
| Superior trapezius | 2.5 | Dumbbell Shrug | 2.43 | 0.34 |   |
|  | - | Up Shoulder with TheraBand | 1.80 | 0.17 | 0.032 |
| Middle + inferior trapezius | 4 | Cable Rowing | 3.25 | 0.38 |   |
|  | body | Inverted Row (large amplitude) | 2.07 | 0.07 | 0.035 |
|  | 2.5 | Dumbbell Bent-over Row | 1.83 | 0.30 | 0.003 |
| Pectoralis | 2.5 | Push-up Dumbbell Bench Press | 1.29 | 0.53 |   |
|  | body | Push-up | 1.25 | 0.75 | 0.955 |
| Serratus | body | Incline Push-up | 2.12 | 0.59 |   |
|  | 2 | Cable Incline Shoulder Raise | 0.47 | 0.26 | 0.046 |
|   | 2.5 | Dumbbell Incline Shoulder Raise | 0.15 | 0.10 | 0.024 |

\* Data are reported for the participant performing three trials for each exercise

† *P* values obtained with use of Student’s *t*-test

**Table S4:** Peak length variation (%) of the inferior subscapularis muscle for each exercise (n = 3)\*. Exercises are classified according to their impact on the joint.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Muscle trained** | **Weight (kg)** | **Exercise** | **Mean\*\*** | **SD** | ***P* value**† |
| Deltoid | 2.5 | Dumbbell Lying Rear Delt Row | 107% | 1% |   |
|  | 10 | Cable Bar Upright Row | 108% | 1% | 0.359 |
|   | - | Elevation with TheraBand | 118% | 1% | 0.011 |
| Supraspinatus | 2 | Cable Seated Front Lateral Raise | 116% | 1% |   |
|  | 2.5 | Dumbbell Lateral Raise | 118% | 0% | 0.010 |
|  | - | Elevation with TheraBand | 118% | 1% | 0.012 |
| Infraspinatus + teres minor | body | Inverted row (small amplitude) | 103% | 1% |   |
|  | 1 | Dumbbell Seated Shoulder External Rotation | 114% | 1% | 0.004 |
|  | 2 | Cable Seated Shoulder External Rotation | 115% | 0% | 0.001 |
|  | - | Elevation with TheraBand | 118% | 1% | 0.004 |
| Subscapularis | 4 | Cable Standing Shoulder Internal Rotation | 103% | 1% |   |
|  | 2.5 | Dumbbell Seated Shoulder External Rotation on the Floor | 103% | 1% | 0.321 |
|   | - | Internal Rotation with TheraBand | 107% | 1% | 0.070 |
| Biceps | 8 | Cable Curl | 97% | 0% |   |
|  | 2.5 | Dumbbell Curl | 100% | 0% | 0.007 |
|   | body | Chin Up | 107% | 1% | 0.005 |
| Triceps | body | Bench Dip | 94% | 0% |   |
|  | 1 | Dumbbell Kick Back | 99% | 1% | 0.030 |
|  | 2 | Cable Bent-over Triceps Extension | 122% | 1% | 0.000 |
| Latissimus dorsi | 4 | Cable Standing Row | 101% | 2% |   |
|  | 2.5 | Dumbbell Lying Row | 108% | 0% | 0.030 |
| Superior trapezius | 2.5 | Dumbbell Shrug | 95% | 0% |   |
|  | - | Up Shoulder with TheraBand | 95% | 0% | 0.292 |
| Middle + inferior trapezius | 4 | Cable Rowing | 103% | 0% |   |
|  | 2.5 | Dumbbell Bent-over Row | 107% | 0% | 0.002 |
|  | body | Inverted Row (large amplitude) | 111% | 1% | 0.004 |
| Pectoralis | body | Push-up | 107% | 0% |   |
|  | 2.5 | Push-up Dumbbell Bench Press | 109% | 1% | 0.076 |
| Serratus | body | Incline Push-up | 108% | 1% |   |
|  | 2.5 | Dumbbell Incline Shoulder Raise | 109% | 0% | 0.837 |
|   | 2 | Cable Incline Shoulder Raise | 114% | 2% | 0.043 |

\* Data are reported for the participant performing three trials for each exercise

\*\* Percentage > 100% means that the muscle is elongated, otherwise it is compressed during motion

† *P* values obtained with use of Student’s *t*-test

**Table S5:** Peak length variation (%) of the superior subscapularis muscle for each exercise (n = 3)\*. Exercises are classified according to their impact on the joint.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Muscle trained** | **Weight (kg)** | **Exercise** | **Mean\*\*** | **SD** | ***P* value**† |
| Deltoid | 10 | Cable Bar Upright Row | 86% | 1% |   |
|  | - | Elevation with TheraBand | 92% | 1% | 0.001 |
|   | 2.5 | Dumbbell Lying Rear Delt Row | 96% | 2% | 0.021 |
| Supraspinatus | 2 | Cable Seated Front Lateral Raise | 91% | 1% |   |
|  | - | Elevation with TheraBand | 92% | 1% | 0.004 |
|  | 2.5 | Dumbbell Lateral Raise | 95% | 0% | 0.025 |
| Infraspinatus + teres minor | - | Elevation with TheraBand | 92% | 1% |   |
|  | body | Inverted row (small amplitude) | 93% | 1% | 0.642 |
|  | 2 | Cable Seated Shoulder External Rotation | 95% | 1% | 0.000 |
|  | 1 | Dumbbell Seated Shoulder External Rotation | 96% | 1% | 0.015 |
| Subscapularis | 2.5 | Dumbbell Seated Shoulder External Rotation on the Floor | 91% | 1% |   |
|  | 4 | Cable Standing Shoulder Internal Rotation | 92% | 1% | 0.354 |
|   | - | Internal Rotation with TheraBand | 97% | 0% | 0.031 |
| Biceps | 8 | Cable Curl | 89% | 0% |   |
|  | 2.5 | Dumbbell Curl | 93% | 0% | 0.001 |
|   | body | Chin Up | 96% | 0% | 0.001 |
| Triceps | 2 | Cable Bent-over Triceps Extension | 91% | 1% |   |
|  | body | Bench Dip | 91% | 0% | 0.507 |
|  | 1 | Dumbbell Kick Back | 93% | 0% | 0.013 |
| Latissimus dorsi | 2.5 | Dumbbell Lying Row | 92% | 0% |   |
|  | 4 | Cable Standing Row | 96% | 2% | 0.076 |
| Superior trapezius | 2.5 | Dumbbell Shrug | 92% | 0% |   |
|  | - | Up Shoulder with TheraBand | 92% | 1% | 0.149 |
| Middle + inferior trapezius | 4 | Cable Rowing | 92% | 0% |   |
|  | 2.5 | Dumbbell Bent-over Row | 92% | 1% | 0.737 |
|  | body | Inverted Row (large amplitude) | 98% | 1% | 0.004 |
| Pectoralis | body | Push-up | 91% | 1% |   |
|  | 2.5 | Push-up Dumbbell Bench Press | 102% | 1% | 0.009 |
| Serratus | 2.5 | Dumbbell Incline Shoulder Raise | 84% | 1% |   |
|  | body | Incline Push-up | 92% | 1% | 0.004 |
|   | 2 | Cable Incline Shoulder Raise | 95% | 2% | 0.011 |

\* Data are reported for the participant performing three trials for each exercise

\*\* Percentage > 100% means that the muscle is elongated, otherwise it is compressed during motion

† *P* values obtained with use of Student’s *t*-test

**Table S6:** Peak length variation (%) of the infraspinatus muscle for each exercise (n = 3)\*. Exercises are classified according to their impact on the joint.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Muscle trained** | **Weight (kg)** | **Exercise** | **Mean\*\*** | **SD** | ***P* value**† |
| Deltoid | 10 | Cable Bar Upright Row | 93% | 0% |   |
|  | - | Elevation with TheraBand | 97% | 0% | 0.002 |
|   | 2.5 | Dumbbell Lying Rear Delt Row | 102% | 1% | 0.004 |
| Supraspinatus | 2 | Cable Seated Front Lateral Raise | 88% | 1% |   |
|  | - | Elevation with TheraBand | 97% | 0% | 0.004 |
|  | 2.5 | Dumbbell Lateral Raise | 98% | 0% | 0.004 |
| Infraspinatus + teres minor | 2 | Cable Seated Shoulder External Rotation | 91% | 0% |   |
|  | 1 | Dumbbell Seated Shoulder External Rotation | 93% | 1% | 0.051 |
|  | - | Elevation with TheraBand | 97% | 0% | 0.001 |
|  | body | Inverted row (small amplitude) | 97% | 1% | 0.004 |
| Subscapularis | 2.5 | Dumbbell Seated Shoulder External Rotation on the Floor | 92% | 1% |   |
|  | - | Internal Rotation with TheraBand | 95% | 1% | 0.009 |
|   | 4 | Cable Standing Shoulder Internal Rotation | 97% | 1% | 0.015 |
| Biceps | 8 | Cable Curl | 97% | 0% |   |
|  | 2.5 | Dumbbell Curl | 97% | 0% | 0.035 |
|   | body | Chin Up | 101% | 2% | 0.043 |
| Triceps | 2 | Cable Bent-over Triceps Extension | 83% | 2% |   |
|  | 1 | Dumbbell Kick Back | 103% | 1% | 0.002 |
|  | body | Bench Dip | - | - | - |
| Latissimus dorsi | 2.5 | Dumbbell Lying Row | 100% | 1% |   |
|  | 4 | Cable Standing Row | 103% | 1% | 0.088 |
| Superior trapezius | - | Up Shoulder with TheraBand | 102% | 1% |   |
|  | 2.5 | Dumbbell Shrug | 103% | 0% | 0.079 |
| Middle + inferior trapezius | body | Inverted Row (large amplitude) | 96% | 2% |   |
|  | 2.5 | Dumbbell Bent-over Row | 102% | 0% | 0.023 |
|  | 4 | Cable Rowing | 103% | 1% | 0.032 |
| Pectoralis | 2.5 | Push-up Dumbbell Bench Press | 98% | 1% |   |
|  | body | Push-up | 99% | 0% | 0.041 |
| Serratus | 2.5 | Dumbbell Incline Shoulder Raise | 81% | 1% |   |
|  | 2 | Cable Incline Shoulder Raise | 95% | 2% | 0.004 |
|   | body | Incline Push-up | 100% | 0% | 0.001 |

\* Data are reported for the participant performing three trials for each exercise

\*\* Percentage > 100% means that the muscle is elongated, otherwise it is compressed during motion

† *P* values obtained with use of Student’s *t*-test

**Table S7:** Peak length variation (%) of the supraspinatus muscle for each exercise (n = 3)\*. Exercises are classified according to their impact on the joint.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Muscle trained** | **Weight (kg)** | **Exercise** | **Mean\*\*** | **SD** | ***P* value**† |
| Deltoid | 10 | Cable Bar Upright Row | 88% | 1% |   |
|  | - | Elevation with TheraBand | 91% | 0% | 0.056 |
|   | 2.5 | Dumbbell Lying Rear Delt Row | 100% | 1% | 0.001 |
| Supraspinatus | 2 | Cable Seated Front Lateral Raise | 83% | 1% |   |
|  | - | Elevation with TheraBand | 91% | 0% | 0.001 |
|  | 2.5 | Dumbbell Lateral Raise | 94% | 0% | 0.001 |
| Infraspinatus + teres minor | 2 | Cable Seated Shoulder External Rotation | 88% | 1% |   |
|  | 1 | Dumbbell Seated Shoulder External Rotation | 89% | 0% | 0.062 |
|  | - | Elevation with TheraBand | 91% | 0% | 0.009 |
|  | body | Inverted row (small amplitude) | 92% | 1% | 0.008 |
| Subscapularis | 2.5 | Dumbbell Seated Shoulder External Rotation on the Floor | 87% | 1% |   |
|  | 4 | Cable Standing Shoulder Internal Rotation | 91% | 0% | 0.006 |
|   | - | Internal Rotation with TheraBand | 92% | 1% | 0.009 |
| Biceps | 8 | Cable Curl | 91% | 0% |   |
|  | 2.5 | Dumbbell Curl | 92% | 1% | 0.013 |
|   | body | Chin Up | 100% | 1% | 0.007 |
| Triceps | 2 | Cable Bent-over Triceps Extension | 77% | 1% |   |
|  | 1 | Dumbbell Kick Back | 97% | 1% | 0.001 |
|  | body | Bench Dip | - | - | - |
| Latissimus dorsi | 2.5 | Dumbbell Lying Row | 95% | 1% |   |
|  | 4 | Cable Standing Row | 99% | 1% | 0.077 |
| Superior trapezius | - | Up Shoulder with TheraBand | 96% | 0% |   |
|  | 2.5 | Dumbbell Shrug | 97% | 0% | 0.075 |
| Middle + inferior trapezius | 4 | Cable Rowing | 96% | 1% |   |
|  | 2.5 | Dumbbell Bent-over Row | 97% | 1% | 0.518 |
|  | body | Inverted Row (large amplitude) | - | - | - |
| Pectoralis | 2.5 | Push-up Dumbbell Bench Press | 97% | 2% |   |
|  | body | Push-up | - | - | - |
| Serratus | 2.5 | Dumbbell Incline Shoulder Raise | 74% | 1% |   |
|  | 2 | Cable Incline Shoulder Raise | 91% | 3% | 0.010 |
|   | body | Incline Push-up | - | - |  - |

\* Data are reported for the participant performing three trials for each exercise

\*\* Percentage > 100% means that the muscle is elongated, otherwise it is compressed during motion

† *P* values obtained with use of Student’s *t*-test

**Table S8:** Peak length variation (%) of the teres minor muscle for each exercise (n = 3)\*. Exercises are classified according to their impact on the joint.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Muscle trained** | **Weight (kg)** | **Exercise** | **Mean\*\*** | **SD** | ***P* value**† |
| Deltoid | - | Elevation with TheraBand | 121% | 1% |   |
|  | 2.5 | Dumbbell Lying Rear Delt Row | 125% | 1% | 0.044 |
|   | 10 | Cable Bar Upright Row | 135% | 1% | 0.001 |
| Supraspinatus | 2.5 | Dumbbell Lateral Raise | 120% | 2% |   |
|  | - | Elevation with TheraBand | 121% | 1% | 0.430 |
|  | 2 | Cable Seated Front Lateral Raise | 128% | 2% | 0.061 |
| Infraspinatus + teres minor | body | Inverted row (small amplitude) | 117% | 1% |   |
|  | - | Elevation with TheraBand | 121% | 1% | 0.007 |
|  | 2 | Cable Seated Shoulder External Rotation | 122% | 1% | 0.003 |
|  | 1 | Dumbbell Seated Shoulder External Rotation | 127% | 1% | 0.005 |
| Subscapularis | 4 | Cable Standing Shoulder Internal Rotation | 120% | 1% |   |
|  | - | Internal Rotation with TheraBand | 122% | 1% | 0.133 |
|   | 2.5 | Dumbbell Seated Shoulder External Rotation on the Floor | 123% | 0% | 0.058 |
| Biceps | 2.5 | Dumbbell Curl | 117% | 0% |   |
|  | 8 | Cable Curl | 118% | 0% | 0.002 |
|   | body | Chin Up | 119% | 1% | 0.075 |
| Triceps | 1 | Dumbbell Kick Back | 118% | 1% |   |
|  | 2 | Cable Bent-over Triceps Extension | 122% | 0% | 0.013 |
|  | body | Bench Dip | 129% | 2% | 0.006 |
| Latissimus dorsi | 4 | Cable Standing Row | 119% | 3% |   |
|  | 2.5 | Dumbbell Lying Row | 120% | 1% | 0.590 |
| Superior trapezius | 2.5 | Dumbbell Shrug | 116% | 0% |   |
|  | - | Up Shoulder with TheraBand | 119% | 1% | 0.013 |
| Middle + inferior trapezius | body | Inverted Row (large amplitude) | 122% | 2% |   |
|  | 2.5 | Dumbbell Bent-over Row | 123% | 1% | 0.816 |
|  | 4 | Cable Rowing | 131% | 2% | 0.060 |
| Pectoralis | 2.5 | Push-up Dumbbell Bench Press | 119% | 1% |   |
|  | body | Push-up | 135% | 2% | 0.006 |
| Serratus | 2 | Cable Incline Shoulder Raise | 124% | 3% |   |
|  | 2.5 | Dumbbell Incline Shoulder Raise | 128% | 1% | 0.149 |
|   | body | Incline Push-up | 135% | 1% | 0.013 |

\* Data are reported for the participant performing three trials for each exercise

\*\* Percentage > 100% means that the muscle is elongated, otherwise it is compressed during motion

† *P* values obtained with use of Student’s *t*-test