

## Supplementary file 3. GRADE

Table S1. Diagnostics											
Test	Test result	Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Number of participants	Diagnostic accuracy	Certainty
<b>Subacromial impingement</b>											
Composit test (combination of Hawkins-Kennedy, Neer, Painful arc, Empty can/Jobe, external rotation against resistance) <sup>1</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	55	LR+=2.93 LR-=0.34	Low Low
<b>Internal posterosuperior impingement</b>											
Posterior impingement test <sup>2</sup>	Positive Negative	1	Prospective cohort study	N/I	Not assessed	Not assessed	Not assessed	Not assessed	69	LR+=5.0 LR-=0.29	N/A <sup>c</sup>
<b>Anterior instability</b>											
Apprehension <sup>1</sup>	Positive Negative	2	Retrospective cohort studies	Not serious	Not serious	Serious <sup>a</sup>	Serious <sup>b</sup>	Large effect <sup>d</sup>	409	LR+=17.21 LR-=0.39	Moderate Low
Relocation <sup>1</sup>	Positive Negative	3	Cohort studies	Not serious	Serious <sup>e</sup>	Serious <sup>a</sup>	Serious <sup>f</sup>	None	509	LR+=5.48 LR-=0.55	Very low Very low
Surprise <sup>1</sup>	Positive Negative	2	Cohort studies	Not serious	Serious <sup>e</sup>	Serious <sup>a</sup>	Serious <sup>f</sup>	None	128	LR+=5.42 LR-=0.25	Very low Very low
Apprehension + relocation <sup>1</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not serious	Serious <sup>a</sup>	Serious <sup>b</sup>	Large effect <sup>d</sup>	46	LR+=39.68 LR-=0.19	Moderate Moderate
<b>SLAP</b>											
Biceps load II <sup>3c</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	Large effect <sup>g</sup>	127	LR+=26.38/PPV=92.1 LR-=0.11/NPV=95.5	Moderate Moderate
<b>Biceps-Labrum complex injuries</b>											
O'Brien's active compression; Inside <sup>4 d</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	116	LR+=1.62/PPV=63.2 LR-=0.27/NPV=77.8	Low Low
O'Brien's active compression; Junctional <sup>4 d</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	116	LR+=2.48/PPV=82.4 LR-=0.15/NPV=77.8	Low Low
O'Brien's active compression;	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	Large effect <sup>h</sup>	116	LR+=2.00/PPV=65.7 LR-=0.08/NPV=92.6	Low Moderate

Bicipital tunnel <sup>d</sup>											
Throwing test; Inside <sup>d</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	116	LR+=2.32/PPV=71.2 LR-=0.36/NPV=72.1	Low Low
Throwing test; Junctional <sup>d</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	116	LR+=3.42/PPV=86.5 LR-=0.35/NPV=60.5	Moderate Low
Throwing test; Bicipital tunnel <sup>d</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	116	LR+=2.09/PPV=66.7 LR-=0.40/NPV=72.1	Low Low
Bicipital tunnel palpation; Inside <sup>d</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	116	LR+=1.92/PPV=67.2 LR-=0.16/NPV=85.7	Low Moderate
Bicipital tunnel palpation; Junctional <sup>d</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	Large effect <sup>h</sup>	116	LR+=3.43/PPV=86.6 LR-=0.09/NPV=85.7	Moderate Moderate
Bicipital tunnel palpation; Bicipital tunnel <sup>d</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	Large effect <sup>h</sup>	116	LR+=2.24/PPV=68.2 LR-=0.04/NPV=96.4	Low Moderate
Yergasons test; Inside <sup>d</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	116	LR+=2.13 LR-=0.76	Low Low
Yergasons test; Junctional <sup>d</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	116	LR+=6.57 LR-=0.83	Low Low
Yergasons test; Bicipital tunnel <sup>d</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	116	LR+=12.43 LR-=0.75	Moderate Low
<b>Rotator cuff injury</b>											
Painful Arc <sup>5</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	104	LR+=3.70 LR-=0.36	Low Low
Gerber/Lift-off test <sup>5</sup>	Positive Negative	2	Prospective cohort studies	Not serious	Serious <sup>i</sup>	Serious <sup>a</sup>	Serious <sup>b</sup>	None	233	LR+=1.40-1.50 LR-=0.63-0.85	Low Low
External rotation against resistance <sup>5</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	203	LR+=2.60 LR-=0.49	Low Low
Full can <sup>5</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	104	LR+=2.40 LR-=0.37	Low Low
Empty can/Jobe <sup>5</sup>	Positive Negative	3	Prospective cohort studies	Not serious	Serious <sup>e</sup>	Serious <sup>a</sup>	Serious <sup>f</sup>	None	337	LR+=1.30 LR-=0.64	Very low Very low
<b>Full rotator cuff rupture</b>											
External rotation lag <sup>5</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	None	37	LR+=7.20 LR-=0.57	Low Low

Internal rotation lag <sup>5</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>	Large effect <sup>h</sup>	37	LR+=5.60 LR-=0.04	Low Moderate
Drop sign <sup>5</sup>	Positive Negative	1	Prospective cohort study	Not serious	Not assessed	Serious <sup>a</sup>	Serious <sup>b</sup>		37	LR+=3.20 LR-=0.35	Low Low

## Explanations:

<sup>a</sup> Downgraded one level due to the population being non-athletes

<sup>b</sup> Downgraded one level due to a limited number of included studies

<sup>c</sup> The article by Meister et al. was not obtained in full text hindering risk of bias assessment

<sup>d</sup> Positive test result upgraded one level due to high diagnostic accuracy

<sup>e</sup> Downgraded one level due to significant heterogeneity in the pooled estimate

<sup>f</sup> Downgraded one level due to wide 95% confidence intervals in pooled estimates

<sup>g</sup> Positive and negative test results were upgraded one level due to high diagnostic accuracy

<sup>h</sup> Negative test result was upgraded one level due to high diagnostic accuracy

<sup>i</sup> Downgraded one level due to large variability in point estimates between studies

Table S2. Prevention										
Outcome/intervention	Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Number of participants	Effect (95% CI)	Certainty
<b>Risk of shoulder problems (all shoulder problems)</b>										
Oslo Sports Trauma Research Center Shoulder Injury Prevention program vs. usual care <sup>6</sup>	1	Randomized controlled trial	Not serious	Not assessed	Not serious	Serious <sup>a</sup>	None	660	OR= 0.72 [0.52 to 0.98]	Moderate
<b>Risk of shoulder problems (substantial shoulder problems)</b>										
Oslo Sports Trauma Research Center Shoulder Injury Prevention program vs. usual care <sup>6</sup>	1	Randomized controlled trial	Not serious	Not assessed	Not serious	Serious <sup>a</sup>	None	660	OR= 0.78 [0.53 to 1.16]	Moderate
<b>Risk of shoulder injury</b>										
Shoulder Control program vs. usual care <sup>7</sup>	1	Randomized controlled trial	Not serious	Not assessed	Not serious	Serious <sup>a</sup>	None	464	HRR= 0.44 [0.29 to 0.68]	Moderate
Throwing injury prevention program vs. usual care <sup>8</sup>	1	Randomized controlled trial	Not serious	Not assessed	Not serious	Serious <sup>a</sup>	None	237	HR= 0.48 [0.21 to 1.08]	Moderate
FIFA 11+ shoulder prevention program vs. usual care <sup>9</sup>	1	Randomized controlled trial	Not serious	Not assessed	Not serious	Serious <sup>a</sup>	None	726	IRR= 0.28 [0.13 to 0.60]	Moderate
Intervention including Sleeper's stretch vs. usual care <sup>10</sup>	1	Prospective cohort study	Serious <sup>b</sup>	Not assessed	Not serious	Serious <sup>a</sup>	None	46	HR=0.35 [0.13 to 0.94]	Very low
Intervention including Sleeper's stretch and prone shoulder external rotation exercise vs. usual care <sup>10</sup>	1	Prospective cohort study	Serious <sup>b</sup>	Not assessed	Not serious	Serious <sup>a</sup>	None	60	HR=0.47 [0.20 to 1.10]	Very low
Pas et al. <sup>11</sup>	1	Randomized controlled trial	Serious <sup>a</sup>	Not assessed	Not serious	Serious <sup>a</sup>	None	579	OR=0.96 (p=0.93)	Low
Achenbach et al. <sup>12</sup>	1	Randomized controlled trial	Serious <sup>a</sup>	Not assessed	Not serious	Serious <sup>a</sup>	None	579	Absolute risk reduction= -2.5% [-10.3 to 5.4]	Low
<b>Number of shoulder pain episodes</b>										

Intervention including functional exercises using resistance bands or dumbbells vs. usual care <sup>13</sup>	1	Randomized controlled trial	Serious <sup>c</sup>	Not assessed	Not serious	Serious <sup>a</sup>	None	26	Between-group difference in number of shoulder pain episodes= 2.8 [CI not reported], p=0.02	Low
<b>Patient-reported shoulder pain</b>										
Intervention including shoulder strengthening exercises vs. usual care <sup>14</sup>	1	Randomized controlled trial	Not serious	Not assessed	Not serious	Serious <sup>a</sup>	None	206	Between group difference in VAS= 0.1 [CI not reported], p=0.746	Moderate
<p>Explanations:</p> <p><sup>a</sup> Downgraded one level due to a limited number of included studies</p> <p><sup>b</sup> Downgraded one level due to critical risk of bias in ROBINS-I</p> <p><sup>c</sup> Downgraded one level due to high risk of bias in ROB-2</p> <p>OR, odds ratio; HR, hazard ratio; IRR, incidence rate ratio; VAS, visual analog scale</p>										

Table S3. Treatment										
Intervention/outcome	Number of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Number of participants	Effect (95% CI or SD)	Certainty
<b>Subacromial impingement</b>										
Intervention including shoulder specific warm-up and exercises vs. no intervention on pain (NRS) <sup>15</sup>	1	Randomized controlled trial	Not serious	Not assessed	None	Serious <sup>a</sup>	None	30	Within-in group baseline and follow-up scores [SD]  Intervention 7.88 [1.02] to 3.56 [1.31]  Control 7.71 [0.83] to 8.00 [0.88]	Moderate
Intervention including strengthening exercises (no comparator group) on pain and function (SPADII) <sup>16</sup>	1	Prospective cohort study	Not serious	Not assessed	None	Serious <sup>a</sup>	None	47	Within-in group baseline and follow-up scores [SD]  29.86 [17.03] to 11.7 [13.78]	Very low
<b>Supraspinatus tendinopathy</b>										
Interventions including hyperthermia or ultrasound vs. passive stretches on pain (VAS) <sup>17</sup>	1	Randomized controlled trial	Not serious	Not assessed	None	Serious <sup>a</sup>	None	37	Within-in group baseline and follow-up scores [SD]  Hyperthermia 5.96 [0.83] to 1.2 [0.63]  Ultrasound 6.3 [0.86] to 5.15 [0.87]  Passive stretches 6.1 [0.89] to 4.9 [0.88]	Moderate
Interventions including hyperthermia or ultrasound vs. passive stretches on physical function (Constant Murley Score) <sup>17</sup>	1	Randomized controlled trial	Not serious	Not assessed	None	Serious <sup>a</sup>	None	37	Within-in group baseline and follow-up scores [SD]  Hyperthermia 58.6 [3.9] to 82.0 [5.7]  Ultrasound 58.9 [2.8] to 61.8 [4.2]	Moderate

									Passive stretches 59.5 [2.7] to 63.3 [5.6]	
<b>Shoulder pain</b>										
Intervention including anteroposterior mobilisation of the shoulder joint vs. manual treatment vs. attention on pain (VAS) <sup>18</sup>	1	Randomized controlled trial	Not serious	Not assessed	None	Serious <sup>a</sup>	None	31	Within-group changes [95% CI]  Mobilization 0.6 [0.1 to 1.1]  Manual treatment 0.0 [0.0 to 0.3]  Attention 0.2 [-0.2 to 0.7]	Moderate
Intervention including anteroposterior mobilisation of the shoulder joint vs. manual treatment vs. attention on physical function (DASH) <sup>18</sup>	1	Randomized controlled trial	Not serious	Not assessed	None	Serious <sup>a</sup>	None	31	Within-group changes [95% CI]  Mobilization 0.3 [-2.7 to 3.4]  Manual treatment 0.5 [-0.3 to 1.3]  Attention 0.7 [-0.6 to 2.0]	Moderate
Intervention including posture correcting exercises vs. no intervention on physical function and pain (ASES) <sup>19</sup>	1	Randomized controlled trial	Serious <sup>b</sup>	Not assessed	None	Serious <sup>a</sup>	None	28	Within-in group baseline and follow-up scores [SD]  Intervention Right shoulder: 89.1 [11.2] to 89.3 [14.6] Left shoulder: 89.9 [11.4] to 91.1 [10.6]  Control Right shoulder: 90.8 [11.7] to 86.4 [17.9] Left shoulder: 90.7 [12.4] to 86.9 [15.5]	Low
Intervention includes strengthening	1	Prospective cohort study	Serious <sup>c</sup>	Not assessed	None	Serious <sup>a</sup>	None	29	Within-in group baseline and follow-up scores [SD]	Very low

exercises (no comparator group) on pain (VAS) <sup>20</sup>									3-months follow-up: 7.5 [2.3] to 3.4 [1.8]  6 months follow-up: 7.5 [2.3] to 2.9 [2.1]	
Intervention including scapula-focused stretching and strengthening exercises (no comparator group) on pain (VAS) <sup>21</sup>	1	Prospective cohort study	Serious <sup>c</sup>	Not assessed	None	Serious <sup>a</sup>	None	31	Within-in group baseline and follow-up scores [SD]  3-months follow-up: 7.2 [1.3] to 2.4 [1.8]  6 months follow-up: 7.2 [1.3] to 2.6 [1.4]	Very low
<p>Explanations:</p> <p><sup>a</sup> Downgraded one level due to a limited number of included studies</p> <p><sup>b</sup> Downgraded one level due to high risk of bias in ROB-2</p> <p><sup>c</sup> Downgraded one level due to high risk of bias in ROBINS-I</p> <p>NRS, numeric rating scale; SPADI, Shoulder Pain and Disability Index; DASH, Disabilities of the Arm, Shoulder, and Hand; ASES, The American Shoulder and Elbow Surgeons Shoulder Score.</p>										



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