

## SUPPLEMENTARY MATERIAL

**Table 1:** Academic, clinical and playing experience of steering, expert and experienced groups

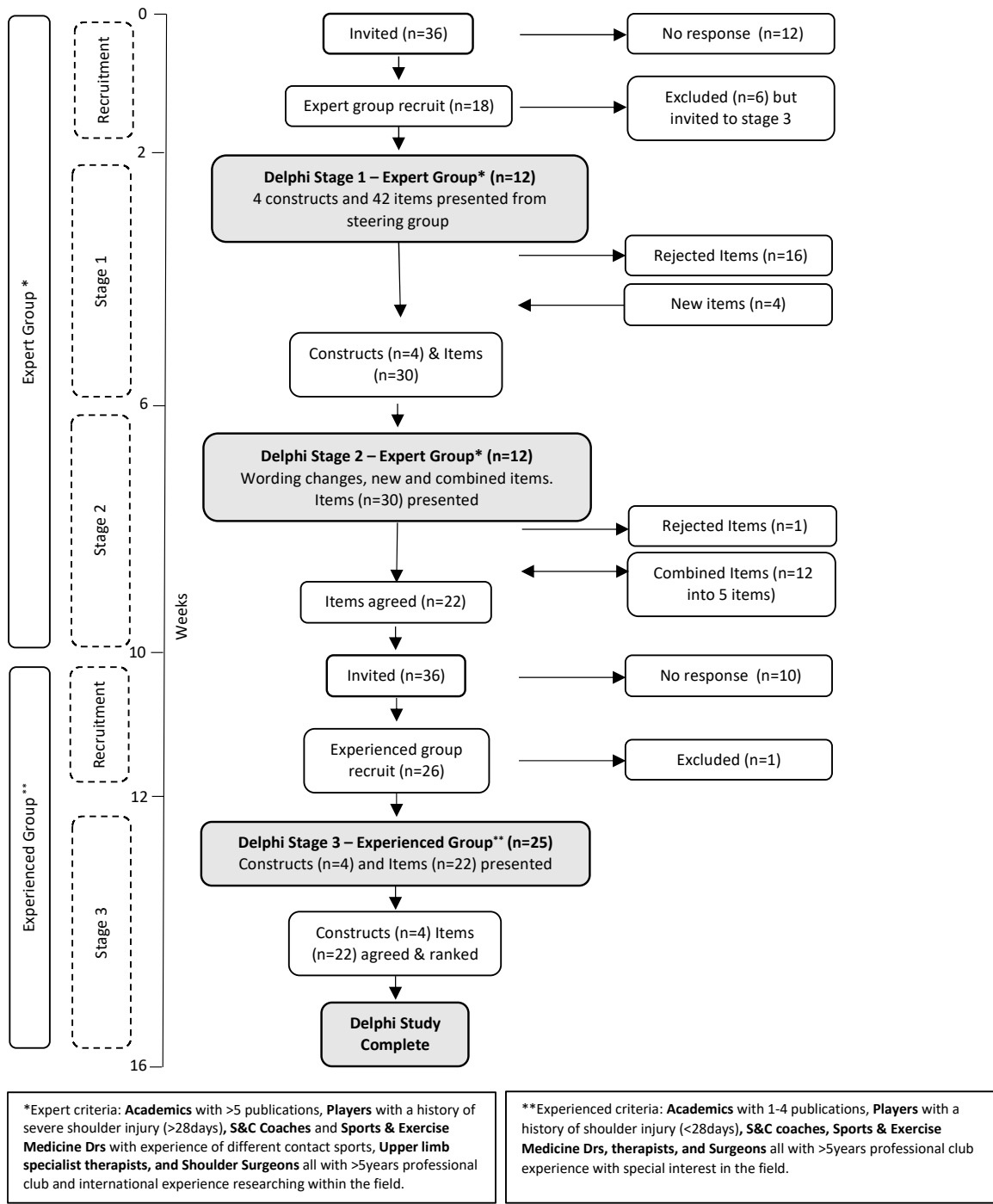
| <i>Academic</i>  |  | <b>Steering Group (n=3)</b>  |  |   | <i>Clinical</i>                              |
|--|--|--|--|---|--|
| 272 (90.7) publications*   |  | Years 41 (12.7), Sports 9 (3), Elite club teams 16 (5.3)                                     |  |   | International teams 4 (1.3)                  |
| <b>Expert Group (n=12)</b>   |  |  |  |   |  |
| Athletes (n=2)   | S&C Coach (n=2)  | Therapist (n=2)  | SEM Dr (n=2)   | Shoulder Surgeon (n=2)  | Academic Researcher (n=2)                    |
| <i>5 years playing experience and a history of a shoulder injury causing absence from playing or training greater than 28 days</i> | <i>UK/ International Registration, 5 years club experience, international experience or related research background.</i> | <i>UK/ International registration, 5 years club experience, researching within the field</i> | <i>UK/ International registration, 5 Years club experience across multi contact and collision sports</i> | <i>5 years shoulder specialist experience &amp; publication history</i> | <b>5+</b> <i>topic specific publications</i> |
| <b>Summary of Expertise Recruited</b>  |  |  |  |   |  |
| 850 club (425) 35 international (17.5) appearances <sup>†</sup>  | 6 elite (3) 4 International (2) teams. 12 (6) publications*  | International Upper limb specialists 27 (13.5) publications*                                 | 11 elite sports (5.5) 41 (20.5) years  | 45 (22.5) surgical years. 88 (44) publications*                         | 96(48) publications*                         |
| <b>Experienced Group (n=25)</b>  |  |  |  |   |  |
| Athletes (n=10)  | S&C coach (n=2)  | Therapist (n=8)  | SEM Dr / Surgeon (n=1) <sup>‡</sup>  | Academic Researcher (n=4)   |  |
| <i>5 years playing experience and a history of a shoulder injury causing absence from playing or training less than 28 days</i>    | <i>UK/ International Registration, 5 years club experience</i>   | <i>UK/ International registration, 5 years club experience</i>                               | <i>UK / International registration, 5 years club experience. / 5 years surgical experience</i>           | <b>1-4 topic specific publications</b>                                  |  |

Key: <sup>‡</sup>Indicated both categories, \*Research gate full text publications (mean) accessed 28/11/22 <sup>†</sup>[www.itsrugby.co.uk](http://www.itsrugby.co.uk) accessed 28/11/22 **Bold text** identifies key differences between expert / experienced criteria

**Table 2:** Constructs (n=4) and items (n=42) proposed and those achieving consensus and not achieving consensus, with agreed wording, new (n=4) and combined items presented in rank order

|  | <i>Constructs</i>  |  |   |   |
|--|--|--|---|---|
|  | Activities of Daily Living   | Range of Motion  | Strength & Conditioning (Athlete Conditioning)  | Sports Specific Training & Competition (Match Play Training and Skills)   |
| Consensus ( $\geq 50\%$ ) stage 1-2 & rank order stage 3 | 1. (92%) Does your shoulder allow you to sleep?  | 1. (67%) Can you elevate your arm above your head?   | 8. (75%) Can you grapple/wrestle upright or on the ground holding an opponent to prevent motion?      | 3. (83%), <u>Can you land on your hand</u> , 4. (75%) <u>elbow or</u> 5. (92%) <u>point of shoulder with the potential for additional force from an opponent</u> , without shoulder problems?   |
|  | 6. (58%) Can you complete all personal hygiene tasks e.g., washing hair / put on a jumper? | 2. (58%) & 3. (50%) <u>Can you fully laterally rotate your shoulder when out to the side and move to full medial rotation?</u> | 14. (50%) Can you perform a plyometric press up – a press up with a flight phase on pressing back up? | 1. (92%) Pass across the body, 2. (75%) Pass in front) <u>Does your shoulder allow you to throw/pass a ball without problems?</u>   |
|  | 8. (60%) *Can you relax the shoulder without hesitation pain or dysfunction?               | 9. (50%) Is your shoulder loose (lax) or are you fearful of it popping out?  | 1. (58%) Can you overhead press with arms out to the side?  | 10. (75%) <u>Can you tolerate typical and</u> (11. (92%)) <u>high force contact through your shoulder?</u>  |
|  | 2. (67%) Can you drive or commute without shoulder problems?                               | 4. (58%) Can you fully laterally rotate your shoulder when by your side?   | 12. (58%) Can you prone pull - lying on your stomach on a surface with a bar or dumbbells?            | 6. (75%) <u>Can you pull or</u> (7. 75%) <u>be pulled</u> (8. (83%)) <u>fend or push without shoulder problems?</u>   |
|  | 5. (50%) Can you cook and shop without shoulder problems, including carrying bags?         | 7. (50%) Can you stretch your arm across your body?  | 10. (58%) Do you have shoulder problems with sprinting without carrying an object in the hands?       | 9. (83%) Can you catch a ball without shoulder problems?<br><br>13. (100%) *Can you perform a straight arm grab or tackle?<br><br>12. (80%) *Can you weight bear through one arm in a tripod/poach position or 'present a ball' position? |
| Did not achieve Consensus (<50%)                         | 3. (42%) Perform housework?  | 5. (25%) Can you reach your hand behind your neck?   | 2. (25%) Pull up?   |   |
|  | 4. (42%) Perform D.I.Y and Gardening? (Including manual paid work in this category)        | 6. (33%) Can you reach your hand behind your back fully?   | 3. (17%) Overhead squat with arms in a straight position?   |   |
|  | 7. (25%) Perform office work?  | 8. (8%) Can you extend your arms back fully behind you?  | 4. (33%) Olympic snatch?  |   |
|  | 9. (40%) *Carry or play with children?   | 10. (42%) Does your shoulder make noises on movement such as clunks, clicks or grinding?                                       | 5. (33%) Olympic clean?   |   |
|  |  |  | 6. (8%) Upright row?  |   |
|  |  |  | 7. (42%) Punch?   |   |
|  |  |  | 9. (33%) Deadlift?  |   |
|  |  |  | 11. (42%) Supine Press?   |   |
|  |  |  | 13. (42%) Press up?   |   |

Key: Original Items numbered (actual % agreement stage 1-2) displayed before each item description/question. Multiple original item % displayed with agreed final wording after stage 2 underlined \*New item added after stage 1.







**Figure 1:** Schematic representation of the Delphi study.

# Rugby Shoulder Function (RSF) Questionnaire

Please use the RSF questionnaire to report your perceived shoulder performance under 4 categories for your dominant (D) and non dominant (ND) shoulders. If you do not regularly perform the movement, exercise, skill or task, you should estimate how you would expect your shoulder to feel whilst performing the task today. Typical problems may include: pain, restriction, laxity or fear to perform. Add up each section for each shoulder and transfer your score to the RSF questionnaire total scores table

|                  |   |   |    |
|------------------|---|---|----|
| Athlete Details: | <b>Final RSF Questionnaire Total Scores</b>     | D | ND |
|                  | Activities of Daily Living Totals               |   |    |
|                  | Range of Motion Section Totals                  |   |    |
|                  | Strength and Conditioning Section Totals        |   |    |
|                  | Sports Specific Training and Competition Totals |   |    |

| Activity of Daily Living   |                   | none | Slight | Moderate | Significant | Severe | unable too | Scores |
|--|-------------------|------|--------|----------|-------------|--------|------------|--------|
| Does your shoulder allow you to sleep?   | Dominant (D)      | 0    | 1      | 2        | 3           | 4      | 5          |        |
|  | Non dominant (ND) | 0    | 1      | 2        | 3           | 4      | 5          |        |
| Can you complete all personal hygiene tasks e.g. washing hair / put on a jumper? | Dominant (D)      | 0    | 1      | 2        | 3           | 4      | 5          |        |
|  | Non dominant (ND) | 0    | 1      | 2        | 3           | 4      | 5          |        |
| Can you relax the shoulder without hesitation pain or dysfunction?               | Dominant (D)      | 0    | 1      | 2        | 3           | 4      | 5          |        |
|  | Non dominant (ND) | 0    | 1      | 2        | 3           | 4      | 5          |        |
| Can you drive or commute without shoulder problems?                              | Dominant (D)      | 0    | 1      | 2        | 3           | 4      | 5          |        |
|  | Non dominant (ND) | 0    | 1      | 2        | 3           | 4      | 5          |        |
| Can you cook and shop without shoulder problems, including carrying bags?        | Dominant (D)      | 0    | 1      | 2        | 3           | 4      | 5          |        |
|  | Non dominant (ND) | 0    | 1      | 2        | 3           | 4      | 5          |        |
| <b>Activities of Daily Living Total (Max 25)</b>                                 |                   |      |        |          |             |        |            |        |

| Range of Motion   |                   | none | Slight | Moderate | Significant | Severe | unable too | Scores |
|---|-------------------|------|--------|----------|-------------|--------|------------|--------|
|  Can you elevate your arm above your head?   | Dominant (D)      | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|  Can you fully laterally rotate your shoulder when out to the side and move to full medial rotation? | Dominant (D)      | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND) | 0    | 1      | 2        | 3           | 4      | 5          |        |
| <b>Shoulder Stability:</b> Is your shoulder loose (lax) or are you fearful of it popping out?   | Dominant (D)      | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|  Can you fully laterally rotate your shoulder when by your side?                                     | Dominant (D)      | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|  Can you stretch your arm across your body?  | Dominant (D)      | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND) | 0    | 1      | 2        | 3           | 4      | 5          |        |
| <b>Range of Motion Section Total (Max 25)</b>   |                   |      |        |          |             |        |            |        |











| <b>Strength and Conditioning</b>  |   |              | none | Slight | Moderate | Significant | Severe | unable too | Scores |
|---|---|--------------|------|--------|----------|-------------|--------|------------|--------|
|    | Can you grapple/wrestle upright or on the ground holding an opponent to prevent motion?   | Dominant (D) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND)   | 0            | 1    | 2      | 3        | 4           | 5      |            |        |
|    | Can you perform a plyometric press up (a press up with a flight phase on pressing back up)?   | Dominant (D) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND)   | 0            | 1    | 2      | 3        | 4           | 5      |            |        |
|    | Can you overhead press with arms out to the side?   | Dominant (D) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND)   | 0            | 1    | 2      | 3        | 4           | 5      |            |        |
|    | Can you prone pull -lying on your stomach on a surface with a bar or dumbbells?   | Dominant (D) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND)   | 0            | 1    | 2      | 3        | 4           | 5      |            |        |
|    | Do you have shoulder problems with sprinting without carrying an object in the hands?   | Dominant (D) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND)   | 0            | 1    | 2      | 3        | 4           | 5      |            |        |
| <b>Strength and Conditioning Section Total (Max 25)</b>                             |   |              |      |        |          |             |        |            |        |
| <b>Sports Specific Training and Competition</b>                                     |   |              | none | Slight | Moderate | Significant | Severe | unable too | Scores |
|  | Can you land on your hand, elbow or point of shoulder without shoulder problems? (with the potential for additional force from an opponent) | Dominant (D) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND)   | 0            | 1    | 2      | 3        | 4           | 5      |            |        |
|  | Does your shoulder allow you to throw/pass a ball without problems?   | Dominant (D) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND)   | 0            | 1    | 2      | 3        | 4           | 5      |            |        |
|   | Can you tolerate typical and high force contact through your shoulder?  | Dominant (D) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND)   | 0            | 1    | 2      | 3        | 4           | 5      |            |        |
|  | Can you pull or be pulled, fend or push without shoulder problems?  | Dominant (D) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND)   | 0            | 1    | 2      | 3        | 4           | 5      |            |        |
|   | Can you catch a ball without shoulder problems?   | Dominant (D) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND)   | 0            | 1    | 2      | 3        | 4           | 5      |            |        |
|  | Can you perform a straight arm grab or tackle?  | Dominant (D) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND)   | 0            | 1    | 2      | 3        | 4           | 5      |            |        |
|  | Can you weight bear through one arm in a tripod/poach position or 'present a ball' position?  | Dominant (D) | 0    | 1      | 2        | 3           | 4      | 5          |        |
|   | Non dominant (ND)   | 0            | 1    | 2      | 3        | 4           | 5      |            |        |
| <b>Sports Specific Training and Competition Total (Max 35)</b>                      |   |              |      |        |          |             |        |            |        |

Figure 2: RSF questionnaire