# ANTHROPOMETRIC AND PHYSICAL QUALITIES OF INTERNATIONAL LEVEL FEMALE RUGBY SEVENS ATHLETES BASED ON PLAYING POSITION

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## ABSTRACT

Agar-Newman, DJ, Goodale, TL, and Klimstra, MD. Anthropometric and Physical Qualities of International Level Female Rugby Sevens Athletes Based on Playing Position. *J Strength Cond Res* 31(5): 1346–1352, 2017—The purpose of this study was to profile international level female sevens athletes and determine whether anthropometric and physical qualities are able to differentiate between backs and forwards. Twenty-four subjects with a mean (±*SD*) age of 22.8 ± 4.0 years and body weight of 69.4 ± 5.2 kg were sampled from a national team training program, ranked in the top 3 on the IRB Women's Sevens World Series. Anthropometric (height, body mass, and sum of 7 skinfolds) and performance measures (power clean, front squat, bench press, neutral grip pull-up, 40-m sprint, and 1,600-m run) were collected across the 2013–2014 centralized period and compared across playing position. The 13 backs (mean age ± *SD* = 21.3 ± 3.5 years) and 11 forwards (mean age ± *SD* = 24.5 ± 4.0 years) had significant differences in body mass (66.40 ± 3.48 vs. 72.87 ± 4.79 kg) and initial sprint momentum (366.8 ± 19.8 vs. 399.2 ± 22.4 $kg \cdot m \cdot s^{-1}$). However no other measures showed positional differences. The lack of positional differences in female rugby sevens may be due to the multifarious physical requirements of a sevens athlete, leading to a generic athletic profile, or perhaps due to a lack of selective pressure. Also, it is conceivable that the anthropometric and physical qualities measured in this study lacked the necessary precision or failed to capture the unique attributes of each position. In conclusion, this is the first investigation profiling international level female sevens athletes. The normative data presented within this article highlight the physical requirements of female sevens athletes for strength and conditioning practitioners. In addition, the lack of positional differences discovered should impact the training program design.

**KEY WORDS** speed, strength, running, backs, forwards

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## INTRODUCTION

Identifying the key variables responsible for successful performance is essential when developing elite athletes. It is therefore common practice to quantify physical and anthropometric attributes to determine which factors appear to most readily define success (7). Anthropometric measures often monitored are body mass, standing height, and sum of 7 skinfolds. Physical assessments measure the physical capacity and capabilities of the athletes, which may define their ability to cope with the demands of their sport. For example, in sevens rugby (sevens), athletes are required to sustain high work rates and recover from repetitive sprints (27), justifying the measurement of sprinting ability and aerobic power. Based on the relationships between sport ability, anthropometric measures, and physical qualities, it is assumed that the development of normative anthropometric measures and physical qualities data could assist in athlete development, guiding athletes' training and assisting coaches in team selections. Differences in anthropometric measures and physical qualities have been noted not only between different sports (10,19) but also across levels of performance and positions in rugby codes (9). Therefore, it is important to investigate which anthropometric measures and physical qualities are appropriate for each playing position and level of performance in a given sport.

In the last 10 years, rugby sevens has experienced a growing international profile (18). Additionally, with rugby sevens recent inclusion in the 2016 Olympics, many countries have placed an increased emphasis on the development of rugby sevens athletes. However, much of the research on anthropometric measures and physical qualities comes from male rugby league and 15-a-side rugby union (rugby union). Because of the rules of sevens rugby, there are notable physiological differences from rugby union (27). The shorter game length and less total players in sevens have resulted in a running-dominant game with higher average velocities covered on the female side (100.3 $m \cdot min^{-1}$) (27) and male side (120 ± 173 $m \cdot min^{-1}$) (14) than male rugby union athletes (5). Male sevens athletes have been shown to spend a greater proportion of their total running distance at a speed greater than 5 $m \cdot s^{-1}$ (14) with increased work-to-rest ratios (1:0.4) when compared to rugby union (1:1.2–1.4) (28). The high intensities present in rugby sevens result in greater than 75% of the game spent playing with a heart rate greater than 80% of the athletes' maximum (27).

Because of the increased running demands, modified laws, and reduced game lengths in sevens, it has been suggested that the positional differences present in rugby union (6,13,16,25) may not be as prevalent in sevens (15). With reference to female sevens athletes, drawing conclusions from rugby union and sevens research using male athletes becomes tenuous when considering that the only study comparing female and male sevens athletes showed that the underlying physical qualities of female sevens athletes are significantly different than their male counterparts (22). Therefore, there is a great need to develop a baseline of data focusing on female rugby sevens with position-specific evaluations to assist in athlete development, guiding athletes' training and assisting coaches in team selections for this increasingly popular rugby variant.

Because of the limited application of rugby union research to rugby sevens (24) and specifically the lack of research investigating female sevens athletes, the purpose of this study is twofold: (a) we aim to describe the anthropometric and physical qualities of international level female sevens athletes and (b) to determine whether positional differences exist in these variables for international level female sevens athletes.

## Methods

### Experimental Approach to the Problem

A causal comparative design (ex post facto design) was used to determine whether anthropometric and physical qualities discriminate between playing positions in international level female sevens athletes. The independent variable assessed was playing position, dividing the athletes into forwards and backs. Because of the limitations of working with international level athletes, the dependent variables were limited to anthropometric and physical testing metrics performed as part of the subjects' involvement in the national team training center.

### Subjects

Twenty-three subjects with a mean age of 22.8 ± 4.0 years (range: 16.9–30.4 years) and body mass of 69.36 ± 5.21 kg were sampled from a national team training program ranked in the top 3 on the IRB Women's Sevens World Series. All subjects undertook individualized training plans of which 20 of the subjects trained in a centralized environment for the 10 months that the study was conducted, 2 of the subjects trained in the centralized environment for between 6 and 8 months, and one subject trained in a decentralized environment. The 3 athletes who did not fully partake in the centralized program flew in for training camps and testing. All subjects gave their written informed consent to partake in this study, and parental or guardian signed consent was obtained for participants under the age of 18 years. Ethical approval for the study was obtained from the University of Victoria's Human Research Ethics Board and complied with the principles outlined in the Declaration of Helsinki.

### Procedures

All measurements with the exception of the anthropometric measurements were taken by a professional sport scientist with 6–10 years of experience in elite sport. These measurements consisted of field tests standard to the teams' testing regiment and covered the areas of anthropometry, running speed, horizontal jumping ability, strength, and aerobic ability. All measurements were taken multiple times throughout the preseason and season and presented as the athlete's' average result over the 2013–2014 training period.

*Anthropometric Measures.* The anthropometric measures were conducted before performance testing and training. All measurements followed the International Society for the Advancement of Kinanthropometry (ISAK) protocols (26) and were taken by an ISAK level 2 anthropometrist (skinfolds TEM = 5.1%). The anthropometric measures consisted of body mass measured to 0.01 kg using an HL120 calibrated scale (Avery Berkel, Smethwick, UK) on a hard surface and zeroed before testing. The participants were measured barefoot and wearing minimal clothing (as comfort allowed). Standing height was measured to the nearest 0.5 cm on a stadiometer (Tanita, Tokyo, Japan) using the ISAK stretch stature method. The sum of 7 skinfolds included the triceps, subscapular, biceps, iliac crest, supraspinal, abdominal, front thigh, and medial calf sites. A single set of Harpenden skinfold calipers (Baty International, West Sussex, UK) was used for all measurements and taken to the nearest millimeter.

*Speed and Momentum.* Speed was assessed perpendicular to the wind direction, on turf field (Field Turf, Calhoun, GA, USA), in cleats, using a Brower Timing TC-System (Draper, UT, USA). The assessment consisted of a 40-m sprint with splits taken at 10 and 30 m. To minimize the risk of false signals, a problem identified by Earp and Newton (2012), the first set of gates was lowered to 50 cm and the subjects started with the middle of their front foot positioned 0.75 m behind the first set of timing gates. The remainders of the gates were set to a height of 1.00 m. Each subject was given 3 attempts and allowed to see their previous attempt's time between sprints. The best 40-m time along with the 0- to 10-m split (ISS) and the 30- to 40-m split (MSS) were measured to 0.01 of a second and converted to velocity. The measurements of ISS and MSS have previously been shown to be reliable with an intraclass correlations ($r$) of 0.91 and 0.94, respectively (3).

**Table 1.** Anthropometric measures.*

| | Backs | | | | Forwards | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Test | *n* | Mean | *SD* | CV (%) | *n* | Mean | *SD* | CV (%) | *p* | *d* | Magnitude |
| Height (cm) | 13 | 166.3 | 6.0 | 4 | 11 | 170.5 | 4.3 | 3 | 0.784 | 0.790 | Moderate |
| Body mass (kg) | 13 | 66.40 | 3.48 | 5 | 11 | 72.87 | 4.79 | 7 | 0.019 | 1.545 | Large |
| Sum of 7 (mm) | 13 | 84.4 | 26.1 | 31 | 11 | 95.0 | 12.3 | 13 | 0.996 | 0.520 | Small |
| Weight skinfold ratio ($mm\cdot kg^{-1}$) | 13 | 0.84 | 0.18 | 21 | 11 | 0.78 | 0.08 | 10 | 1.000 | 0.431 | Small |

*Note: *p*-value reported as a Dunn–Šidák adjusted *p*-value.

Momentum was calculated by multiplying the subjects' body mass by their average velocity (1,3) over the 0- to 10-m segment termed initial sprint momentum (ISM). This calculation was extended to the 30- to 40-m zone as sevens athletes are required to sprint distances greater than 30 m (27) and termed maximal sprint momentum (MSM). Momentum was calculated to the nearest 0.01 $kg\cdot m\cdot s^{-1}$.

*Horizontal Jump Ability.* Horizontal jump ability was assessed using a standing long jump (SLJ) and a standing triple jump (STJ) preformed in a bilateral manner. The test was conducted on a turf field (Field Turf) in cleats for all but one session (grass field at an Olympic training center). The subjects started with their toes behind the starting line, and distance was measured from the heel of the athletes' closest foot to the starting line and rounded down to the nearest centimeter. The subjects were given 3 attempts for both jumps and required to stick the landings. If the athlete fell backward or moved their feet on landing, the score of that trial was not recorded. While performing the standing triple jump, the participants were required to minimize the time on the ground between jumps (no reset allowed). The best jump for each test was taken for analysis. Previous research using the same protocol showed a typical error of measure and coefficient of variation (CV) of 0.04 m and 7% for the SLJ and 0.12 m and 7% for the TBJ (2).

*Strength.* Strength testing consisted of the power clean, front squat, bench press, and neutral grip pull-up conducted in that order. All the strength movements were performed using Eleiko (Sweden) plates and bars and measured to the nearest 0.5 kg. In addition, a standardized warmup and testing protocol was used for the 1 repetition maximum (1RM) testing. This consisted of starting at 60% of the subjects predicted 1RM and increasing by 10 until 90% of the subjects predicted 1RM was reached. Reps were then conducted at 95 and 100% of the subjects predicted 1RM before increasing by approximately 2% thereafter.

The power clean commenced with the bar and plates resting on the floor. The participants moved the bar in one motion from the floor to the shoulders. The participants were required to receive the bar on the shoulders, above parallel, defined as the top surface of the leg at the hip joint above the knees for a successful lift. If a participant caught

**Table 2.** Running speed measures.*

| | Backs | | | | Forwards | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Test | *n* | Mean | *SD* | CV (%) | *n* | Mean | *SD* | CV (%) | *p* | *d* | Magnitude |
| 0–10 m speed ($m\cdot s^{-1}$) | 12 | 5.54 | 0.10 | 2 | 11 | 5.43 | 0.12 | 2 | 0.465 | 0.996 | Moderate |
| 30–40 m speed ($m\cdot s^{-1}$) | 12 | 8.21 | 0.26 | 3 | 11 | 8.02 | 0.25 | 3 | 0.840 | 0.745 | Moderate |
| 40-m speed ($m\cdot s^{-1}$) | 12 | 7.14 | 0.18 | 3 | 11 | 7.00 | 0.14 | 2 | 0.613 | 0.868 | Moderate |
| Initial sprint momentum ($kg\cdot m\cdot s^{-1}$) | 12 | 366.81 | 19.83 | 5 | 11 | 399.24 | 22.42 | 6 | 0.028 | 1.532 | Large |
| Maximal sprint momentum ($kg\cdot m\cdot s^{-1}$) | 12 | 545.30 | 31.99 | 6 | 11 | 589.43 | 34.42 | 6 | 0.089 | 1.328 | Large |
| 1,600-m speed ($m\cdot s^{-1}$) | 13 | 4.12 | 0.28 | 7 | 10 | 4.26 | 0.28 | 7 | 0.995 | 0.500 | Small |

*Note: *p*-value reported as a Dunn–Šidák adjusted *p*-value.

**Table 3.** Run times.*

| Test | Backs | | | Forwards | | |
|---|---|---|---|---|---|---|
| | *n* | Mean | *SD* | *n* | Mean | *SD* |
| 0–10 m speed ($s^{-1}$) | 12 | 1.81 | 0.03 | 11 | 1.84 | 0.04 |
| 10–30 m speed ($s^{-1}$) | 12 | 2.54 | 0.06 | 11 | 2.61 | 0.07 |
| 30–40 m speed ($s^{-1}$) | 12 | 1.22 | 0.04 | 11 | 1.25 | 0.04 |
| 40-m speed ($s^{-1}$) | 12 | 5.60 | 0.14 | 11 | 5.72 | 0.12 |
| 1,600-m speed ($s^{-1}$) | 13 | 390 | 28 | 10 | 377 | 25 |

*Note: Times reported to their respective level of resolution.

the bar with the top surface of the leg at the hip joint below the knees or dumped the bar, a miss was recorded.

The 1RM bench press began with the spotter providing assistance unracking the bar to a position over the subject's chest. The bar was then lowered to the participant's chest, lightly touching before being pressed to a locked out position and reracked. The spotter was instructed to assist the participant if the bar stalls for more than 3 seconds or reverses direction during the concentric pressing motion. If the spotter touched the bar at any point besides the initial unracking, a miss was recorded.

The 1RM front squat started with the bar placed in a squat cage. The subject unracked the bar, stepped back, squatted to a depth below parallel, defined as placing the top surface of the leg at the hip joint below the knees. If a participant failed to make the proper depth or dumped the bar, a miss was recorded.

The 1RM neutral grip pull-up began with the athlete hanging motionless for 3 seconds using a neutral grip (palms facing toward each other). A signal was given by the tester for the subject to begin the motion, pulling themselves up and finishing with their chin above the hands. A miss was recorded if the subject assisted the upward movement with their legs or failed to achieve the final position. The weight recorded was the subjects' body mass plus additional weight which was hung from a belt.

*Aerobic*. The athletes' aerobic fitness was assessed using a 1,600-m run conducted on a 400-m gravel track. All athletes had previous experience with this test. The total time ran was converted into average speed over 1,600 m ($m \cdot s^{-1}$).

### Statistical Analyses

The subjects mean testing scores over the course of the 2013–2014 training period, including the 2013–2014 WSWS season, were analyzed. To determine the ability of physical and anthropometric measures to discriminate between positional groups, the data were separated into backs ($n = 13$)

**Table 4.** Strength measures.*

| Test | Backs | | | | Forwards | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *n* | Mean | *SD* | CV (%) | *N* | Mean | *SD* | CV (%) | *p* | *d* | Magnitude |
| Power clean (kg) | 8 | 68.24 | 6.20 | 9 | 7 | 73.52 | 4.46 | 6 | 0.843 | 0.978 | Moderate |
| Front squat (kg) | 8 | 82.50 | 11.30 | 14 | 9 | 84.50 | 5.84 | 7 | 1.000 | 0.222 | Small |
| Bench press (kg) | 11 | 61.85 | 7.15 | 12 | 10 | 68.79 | 7.13 | 10 | 0.559 | 0.972 | Moderate |
| Neutral grip pull-up (kg) | 12 | 78.11 | 6.71 | 9 | 9 | 86.35 | 5.19 | 6 | 0.128 | 1.374 | Large |
| Relative power clean ($kg \cdot kg^{-1}$) | 8 | 1.03 | 0.10 | 10 | 7 | 1.00 | 0.04 | 4 | 1.000 | 0.394 | Small |
| Relative front squat ($kg \cdot kg^{-1}$) | 8 | 1.25 | 0.17 | 14 | 9 | 1.15 | 0.11 | 10 | 0.974 | 0.698 | Moderate |
| Relative bench press ($kg \cdot kg^{-1}$) | 11 | 0.94 | 0.12 | 13 | 10 | 0.94 | 0.11 | 12 | 1.000 | 0.000 | Trivial |
| Relative neutral grip pull-up ($kg \cdot kg^{-1}$) | 12 | 1.18 | 0.11 | 9 | 9 | 1.19 | 0.10 | 8 | 1.000 | 0.095 | Trivial |

*Note: *p*-value reported as a Dunn–Šidák adjusted *p*-value.

**Table 5.** Horizontal jumping measures.*

| | Backs | | | | Forwards | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Test | *n* | Mean | *SD* | CV (%) | *n* | Mean | *SD* | CV (%) | *p* | *d* | Magnitude |
| SLJ (cm) | 12 | 229 | 11 | 5 | 11 | 228 | 9 | 4 | 1.000 | 0.139 | Trivial |
| STJ (cm) | 12 | 705 | 32 | 5 | 11 | 691 | 28 | 4 | 0.999 | 0.457 | Small |

*Note: *p*-value reported is a Dunn–Šidák adjusted *p*-value.

and forwards ($n = 11$). The anthropometric and physical tests were analyzed using a series of independent *t* tests using the pooled variance as $n < 30$. Alpha was set to $p \leq 0.05$ and a Dunn–Šidák correction was applied. Because of the small sample size in conjunction with the Dunn–Šidák correction, it was unlikely that statistical significance would be achieved. Therefore, Cohen's *d* was calculated and presented using Hopkins' scale of effect magnitudes (17) in addition to the adjusted *p* value. All data were analyzed using SYSTAT version 13 (San Jose, CA, USA).

## Results

Backs ($n = 13$) and forwards ($n = 11$) were of similar age, 21.29 ± 3.54 and 24.47 ± 3.95 years, respectively ($p = 0.652$, effect magnitude = moderate). When examining the anthropometric values (refer to Table 1), only body mass was significantly different between the 2 positions. There was a moderate effect magnitude ($d = 0.790$) with forwards being taller than backs (mean difference = −4.14 cm; 95% CI = −8.66 to 0.38); however, this was nonsignificant ($p = 0.784$). In addition, the backs had a larger CV when comparing sum of 7 skinfolds and height skinfold ration.

Examining running speed measures (refer to Tables 2 and 3), ISM was the only measure significantly different between positions. Forwards carried increased momentum over the first 10 m (mean difference = $-32.43\ \mathrm{kg \cdot m \cdot s^{-1}}$; 95% CI = −50.67 to −14.19). In addition, MSM had a large effect magnitude ($d = 1.328$); however, this was nonsignificant ($p = 0.09$). A number of other measures such as 0- to 10-m speed (mean difference = $0.11\ \mathrm{m \cdot s^{-1}}$; 95% CI = 0.01–0.20), 30- to 40-m speed (mean difference = $0.19\ \mathrm{m \cdot s^{-1}}$; 95% CI = −0.03 to 0.41), and 40-m speed (mean difference = 0.14 $\mathrm{m \cdot s^{-1}}$; 95% CI = 0.00–0.28) had nonsignificant *p* values but moderate effect magnitudes.

Finally, none of the strength measures (refer to Table 4) or horizontal jumping measures (refer to Table 5) were significantly different between positions. Although there was a large effect magnitude ($d = 1.374$) when examining the absolute weight lifted in the neutral grip pull-up (mean difference = −8.24 kg; 95% CI = −13.88 to −2.60) and moderate effect magnitudes in the power clean (mean difference = −5.28 kg; 95% CI = −11.39 to 0.82), bench press (mean difference = −6.95 kg; 95% CI = −13.47 to −0.42), and relative front squat (mean difference = 0.10 $\mathrm{kg \cdot kg^{-1}}$; 95% CI = −0.05–0.25).

## Discussion

To the authors' knowledge, this is the first article to profile international level female sevens athletes' anthropometric measures and physical qualities in addition to examining positional differences. Overall, we found that there are very few differences between backs and forwards in female sevens. This is similar to Higham et al. (15) and Ross et al. (24) investigations into male rugby sevens. The only anthropometric and physical qualities that appear to discriminate between playing positions in female sevens rugby are body mass and ISM. This result is unlike male (25) and female (13) rugby union and male (11) and female (10) rugby league where positional differences can be clearly delineated using multiple anthropometric measures and physical qualities. This research demonstrates that although it is beneficial to collect data on anthropometric measures and physical qualities for women's sevens rugby, the specific metrics used here may not be able to distinguish between positional roles and novel standards of differentiation may be required.

The only anthropometric measure difference noted between women's sevens rugby playing position was that of body mass. It is possible that the positional differences in body mass are due to the specific task of scrummaging that forwards undertake. As muscle strength is proportional to the muscles cross sectional area (20) and body mass is highly correlated to force in the scrum (23), it is likely that larger athletes are placed into the forward positions during their development or that specific interventions have led to the forwards becoming larger than backs. Our findings regarding positional differences in body mass are consistent with previous research investigating male rugby sevens (8), female rugby league (10), and female rugby union (13). However, unlike other studies, none of the other anthropometric measures achieved statistical significance.

Another finding of this study was the positional differences in ISM. As ISS was similar between positions (backs = 5.54 ± 0.10 $m \cdot s^{-1}$ vs. forwards = 5.43 ± 0.12 $m \cdot s^{-1}$), it is probable that the difference in ISM relates back to the differences in body mass. It can also be inferred that forwards produce higher levels of absolute power compared to backs as they are able to move larger masses at similar velocities. The finding of ISM being a discriminator of playing position is in agreement with previous research (3). It is likely that future research with a larger sample size would show MSM being a discriminator, as the effect magnitude was large between positions (mean difference = 44.13 $kg \cdot m \cdot s^{-1}$; 95% CI = 15.35–72.93) although not statistically significant. Future research should also examine the relationship between momentum and playing level (national vs. international) and match performance similar to studies in other rugby codes (1,3,12).

Although there was no statistically significant differences between positions in any of the strength measures, neutral grip pull-up strength showed a large magnitude of effect ($d$= 1.374, $p$ = 0.128). It is therefore likely that with a larger sample size, statistical significance would have been shown. However, this effect magnitude became trivial when neutral grip pull-up strength was expressed relative to bodyweight. Previous research examining the relationship between chin-ups and playing position has used varying methods and therefore has achieved varying results. For example, the average number of pull-ups per minute did not differentiate positions in women's rugby union (13); conversely, the number of chin-ups performed to exhaustion has shown the potential to discriminate between positions in elite male junior rugby union athletes (6). It is possible that that absolute pull-up strength may play a positional specific role perhaps impacting tackling or contesting rucks; however, this is speculation because of the lack of research on sevens' technical and tactical aspects.

It is possible that the scarcity of positional differences is due to field tests used lacking the necessary precision to determine positional differences in female sevens athletes. Future research should combine laboratory tests with a finer resolution such as metabolic cart–based $\dot{V}O_2max$ testing and jump/midthigh pulls on a force plate in conjunction with field-based testing. It is also possible that anthropometric measures and physical qualities do not measure the unique attributes of backs and forwards in sevens. Therefore, specific tests designed off positional technical/tactical demands may be necessary to elucidate these differences. For example, tests involving a cognitive component such as measuring an athlete's ability to attack and defend under varying spatial constraints could be useful in future research. However, as previous research in rugby has demonstrated the ability of similar tests to expose positional differences, it is more likely that the reduced number of players leads to multiple common responsibilities per athlete and thus a generic athlete profile as suggested by Higham et al. (15). It is also possible that female sevens is still in its infancy and yet to experience significant competition for roster positions and thus selection pressure, making it unnecessary for morphologic optimization of specialist role players (21).

Compared to previous research examining anthropometric and physical qualities in female sevens athletes, the squad examined had similar ages (22.8 ± 4.0 years vs. 25 ± 5 years), body weights (69.36 ± 5.21 kg vs. 69 ± 7 kg), and skinfolds (89.2 ± 21.2 mm vs. 85 ± 15 mm) as a 2013 study investigating critical power in international level female sevens athletes (4). When comparing the current cohort of athletes to female rugby union athletes selected to play for a high-performance squad prepping for the 2010 Women's Rugby World Cup, the sevens athletes were taller across the forwards (170.5 ± 4.3 cm vs. 165.2 ± 6.4 cm) and backs position (166.3 ± 6.0 cm vs. 160.9 ± 6.5 cm), heavier across the backs position (66.40 ± 3.48 kg vs. 62.97 ± 5.96 kg), had lower sum of 7 skinfolds (backs: 84.4 ± 26.1 mm vs. 106.66 ± 19.12 mm; forwards: 95.0 ± 12.3 mm vs. 137.40 ± 30.08 mm), faster velocities over the 10 m (backs: 5.54 ± 0.10 $m \cdot s^{-1}$ vs. 5.26 ± 0.18 $m \cdot s^{-1}$; forwards: 5.43 ± 0.12 $m \cdot s^{-1}$ vs. 4.81 ± 0.18 $m \cdot s^{-1}$) and 40-m distances (backs: 7.14 ± 0.18 $m \cdot s^{-1}$ vs. 6.71 ± 0.21 $m \cdot s^{-1}$; forwards: 7.00 ± 0.14 $m \cdot s^{-1}$ vs. 6.14 ± 0.27 $m \cdot s^{-1}$) across both positions, and larger bench presses across the forwards and backs positions (backs: 61.85 ± 7.15 kg vs. 55.79 ± 9.17 kg; forwards: 68.79 ± 7.13 kg vs. 63.57 ± 15.86 kg) (13). Taken in conjunction, these comparisons present a compelling case that there are similar anthropometric measures among sevens athletes and that the current cohort of sevens athletes is physically superior to the most recent profiles presented on female rugby union athletes.

In this study, we were able to establish normative data on female sevens athletes and determine that field-based tests delineate few differences in anthropometric measures and physical qualities between playing positions. It appears that this cohort is physically superior to the most recent data published on international level female rugby union athletes (13), likely because of the professional training environment and increased emphasis placed on sevens in the lead up to the 2016 Olympics. Furthermore, as all of the athletes taking part in this study were undertaking individualized training plans, it is likely that this generic profile is a result of the on-field demands of rugby sevens. This uniform profile could suggest that a more generic training plan could be applied across playing positions or perhaps an increased emphasis should be placed on teasing out and training positional differences perhaps using laboratory-based or sports-specific tests. In addition, although some research has profiled the physical demands of the female game (27,28) and the present study profiles the anthropometric and physical qualities of female sevens athletes, it is essential that future research combines the game demands with the physical profiles of the athletes and looks to develop position-specific measures of fitness.

## Practical Applications

The normative data presented within this article should aid strength and conditioning practitioners involved with female rugby sevens athletes. These data can be used as a baseline to identify physical gaps in developmental athletes when compared to their international counterparts. Furthermore, the similarity of the physical and anthropometric profiles of backs and forwards suggests that a similar training program could be used regardless of playing position. However, it should be noted that training of the forwards position should place an increased emphasis on increasing lean body mass and sprint momentum.

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