

## **Fitness Training Programmes for Rugby Football Players**

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Contact sports activities usually involve repeated body impacts during the game. The athlete or player capable of producing greater explosive power than their opposition has a distinct advantage during direct body contact. Concerning rugby, the momentum could be defined as the product of body weight and running speed, and the ability to produce such momentum quickly is directly related to the explosive power of the individual. Therefore, if two players are running at the same speed, the one with the greater body weight has the higher momentum, and will be able to cause the greater influence on their opponent during impact. However, an increase in body weight often reflects in an increase in body fat, rather than lean body tissue and thus yields a decrease in running speed during the game. Kubota<sup>(6)</sup> demonstrated that the formula of “Performance = Skill × Strength” could especially be applied to sports activities, in which the muscle strength and power developed by the athlete or player are significant in the outcome of the game. Therefore, to develop the muscle strength and power is indispensable for rugby football. Players should focus on an appropriate strength training and dietary programme aimed at reducing excess body fat and increasing lean body weight (LBW).

After the 1991 World Cup Rugby Tournament<sup>(13)</sup>, the Japan Rugby Football Union (JRFU) identified the lack of power developed individually, during body contact, as well as the weakness of unit play. Human muscle power is related not only to muscular strength, but also to the speed of extension and flexion of the muscle fiber. The strength of the muscle tissue is expected to be increased through training. On the other hand, muscle contraction speed improves little after training. Therefore,

muscular power is improved mainly by increasing muscle strength. The strength of the muscle lies in proportion to the cross-sectional area of the muscle fiber. The increase of the cross-sectional area represents an enlargement of the muscle (muscle hypertrophy). Wilmore demonstrated<sup>(14)</sup> that gains of running speed as well as body weight were essential to be successful in American Football. Muscle weight should be a better index than merely body weight to appreciate the capability of power development indispensable for American Football players, because body weight includes body fat and the excess body fat causes the deterioration of the running speed. However, players believed that the heavier body weight was "essential" for their play, even though the appreciable part of it was fat.

Ueno<sup>(11)</sup> identified that Japanese rugby coaches have approved excess body fat for forward players, in order to improve their performance in the game. There was little difference (no significant statistically) in body weight among Japan (98.3 kg), Ireland (101.6 kg) and Scotland (98.9 kg) forward players in the 1991 World Cup (Table 1).

Ueno and Wilson<sup>(10)</sup> reported that the average body weight of New Zealand provincial rugby forwards was 92.8kg. The body weights of forward players reported in the other studies were 92.2 kg in England<sup>(9)</sup>, 89.1 kg in Wales<sup>(2)</sup> and 87.7 kg in the USA<sup>(7)</sup>. It should be noted, however, that comparing the average percentage of fat for Japanese players (20.5 %) was much higher, than those of the other countries, though there was a difference in the measurement and estimation technique used. In particular, the percentage of fat for Japanese Props and Hookers was beyond 23 % (Table 2)<sup>(13)</sup>.

In a Chinese Anthropometric Research for Sports Talent Scouting<sup>(5)</sup>, it was reported that players must be tall, strongly-built (large lean body weight), 0.35-0.40 of body weight/body height ratio and less than 15 % of fat volume in the case of field sports. The report also stated players must have a high percentage of muscle and a low percentage of fat to body weight and large circumferences of extremities in the case of martial arts. The Australia Rugby Football Union<sup>(1)</sup> provides a guideline that the percentage of fat for rugby players should not be beyond 15%. Hudson and Davies<sup>(4)</sup> indicated that the percentage of fat should be 12-14% in back players (BKs) and less than 20% in forward players (FWs). Ueno and Wilson<sup>(10)</sup> reported that the average percentage of fat for New Zealand rugby FWs was 11.3% and the average percentage of fat for FWs and BKs was 11.7%<sup>(12)</sup>. The percentage of fat for FWs

**Table 1-a** Body Height

Position	n	JAPAN	n	SCOTLAND	n	IRELAND
Whole Team	26	179.2(11.6)	26	185.5( 9.7)	25	183.9( 9.9)
Forwards	14	183.0( 4.0)	14	188.5( 6.2)	14	186.4( 6.2)
R    R	4	181.5( 2.7)	4	182.3( 1.3)	4	179.8( 1.8)
H    O	2	177.5( 0.5)	2	183.5( 0.5)	2	181.5( 3.5)
L    O	3	188.7( 3.7)	3	197.6( 2.1)	3	195.3( 2.1)
F L & N O 8	5	184.2( 2.3)	5	190.8( 3.1)	5	189.2( 3.8)
Backs	12	171.( 4.1)	12	179.5( 1.8)	11	178.7( 2.5)
S H & S O	4	167.5( 5.5)	4	177.8( 3.3)	4	176.3( 2.6)
CTB&WTB&FB	8	175.8( 4.5)	8	181.4( 5.7)	7	181.3( 5.5)

Value : Mean(cm)  
( ) : S. D.

**Table 1-b** Body Weight

Position	n	JAPAN	n	SCOTLAND	n	IRELAND
Whole Team	26	90.6(11.6)	26	92.9( 9.7)	25	95.0( 9.0)
Forwards	14	98.3( 5.1)	14	98.9( 5.6)	14	101.6( 4.1)
P    R	4	101.8( 5.7)	4	105.5( 3.9)	4	105.3( 3.3)
H    O	2	94.5( 0.5)	2	91.0( 1.0)	2	98.0( 4.0)
L    O	3	104.7( 1.2)	3	102.7( 4.8)	3	106.0( 1.6)
F L & N O 8	5	92.2( 3.2)	5	96.6( 2.9)	5	97.0( 5.1)
Backs	12	75.3( 1.6)	12	80.9( 1.9)	11	81.8( 0.1)
S H & S O	4	73.8( 4.3)	4	79.0( 1.7)	4	81.8( 3.7)
CTB&WTB&FB	8	76.9( 5.5)	8	82.8( 6.5)	7	81.9( 4.6)

Value : Mean(kg)  
( ) : S. D.

**Table 2**

&lt;Foreign Players&gt;

Investigator	Technique	N	Subject	Age(yrs)	Height(cm)	Weight(kg)	%FAT(%)	LBW(kg)
Y. Ueno & B. D. WILSON (1990) New Zealand	S	6	FW	21.5	185.5	92.8	11.3	82.2
Y. Ueno (1991) New Zealand	S	5	FW&BK	23.8	182.8	82.8	11.7	73.1
P. RIGG & T. REILLY (1987) England	S	5	PR	/	176.7	89.2	13.6	77.1
		4	LO	/	196.7	100.8	11.1	89.6
		5	FL&NO8	/	184.8	86.5	11.5	76.6
		4	HB	/	172.8	77.0	12.1	67.6
		6	BK	/	180.4	80.2	10.4	71.9
W. BELL (1980) Wales	H	20	FW	20.8	182.6	89.1	14.6	76.0
		4	PR	/	180.9	90.9	16.9	75.4
		3	HO	/	173.5	77.6	17.2	64.3
		5	LO	/	187.9	98.9	15.6	83.3
		3	NO8	/	189.1	86.9	11.6	76.4
5	FL	/	180.2	86.3	12.1	76.2		
P. J MAUD (1983) U.S.A.	S	15	FW&BK	28.5	179.7	84.4	12.0	74.0
		8	FW	30.7	180.7	87.7	12.4	76.7
		7	BK	26.0	178.4	80.5	11.7	71.0
A. W. SWATSON (1988) England	S	31		16~18	178.5	70.0	12.8	61.0

&lt;Japanese Players&gt;

Investigator	Technique	N	Subject	Age(yrs)	Height(cm)	Weight(kg)	%FAT(%)	LBW(kg)
J. R. F. U (1991)	S	37	FW	22.8	182.2	92.3	20.5	73.2
		5	R. PR.	22.2	178.4	95.2	23.0	73.1
		5	HO	23.4	176.2	90.7	23.8	69.1
		5	L. PR	24.0	179.8	99.2	23.5	76.0
		10	LO	22.5	190.6	95.6	18.6	77.7
		9	FL	23.2	178.9	85.4	19.0	69.2
		4	NO8	21.0	185.0	88.5	17.1	73.3
J. R. F. U (1991)	S	32	BK	22.3	174.0	73.6	14.5	63.0
		5	SH	22.2	165.8	64.9	15.6	54.8
		4	SO	20.2	172.1	72.7	16.6	60.5
		9	CTB	24.2	176.8	75.4	13.7	65.1
		4	L. WTB	20.8	172.7	68.0	12.4	59.6
		5	R. WTB	23.0	178.5	80.4	13.6	69.5
		5	FB	21.4	176.2	78.9	15.4	66.7
Y. Ueno & B. D. WILSON (1990)		7	FW	20.9	179.4	85.3	14.4	73.0

S : Skinfold  
H : Hydrometry

※ J. R. F. U. : JAPAN RUGBY FOOTBALL UNION

was reported as 12.8% in England (Rigg and Reilly<sup>(9)</sup>), 14.6% in Wales (Bell<sup>(2)</sup>) and 12.4% in the USA (Maud)<sup>(7)</sup>.

We could conclude that the percentage of fat for rugby player must be less than 15% and the lean body weight (LBW) should be increased through appropriate weight training programmes in order to improve muscular strength and the power of rugby football players.

The purpose of the present paper was to introduce the fitness factors and fitness training programmes which were established by the New Zealand Rugby Football Union (1987 Rugby World Cup Champion) and by the Australia Rugby Football Union (1992 Rugby World Cup Champion).

### **1. Fitness Training Programmes Established by New Zealand Rugby Union<sup>(8)</sup>**

#### 1) Components of Physical Fitness and Fitness Training

##### **A. Endurance-the ability to sustain physical effort**

###### a. General Endurance

###### (1) Running

Progression from : -

a) long slow (off-season) ; a 30-40 minute run

b) fartlek (pre-season) ; a 20-30 minute run at  
varying pace over undulating  
ground.

c) middle distance intervals (in-season) ;  
400-800 meters at near  
maximal effort interspersed  
with recovery periods of the  
same duration as the running  
periods.

The number of repetitions  
can be progressively  
increased as player fitness  
improves.

b. Specific Endurance (no off-season schedule)

Pre-season and in-season training for this component centers around two types of activities : -

(1) Circuit Training

- a) weights
- b) partner work
- c) body weight exercises

(2) Skills Training

This may incorporate scrummaging and mauling skills into endurance development. Mauling skills may be part of grid training.

**B. Strength**

(1) Weight Training

- a) "Resistance weight training" must always be performed under qualified supervision with the player's maturity being taken into consideration. Heavy resistance weight training should not be considered before 16 years of age.
- b) "Exercises in which players are working against their own body weight" are acceptable for all age group e.g. press-ups.

**C. Speed**

(1) Interval Training

To provide variety four forms of interval training are recommended : -

- a) sprint intervals
- b) tempo training
- c) stress intervals
- d) repetition intervals

**D. Power**

- (1) It is recommended that all players be introduced to plyometric training i. e. training designed to develop explosive power.

**E. Flexibility**

**F. Agility**

- (1) The following activities are designed to add variety to the training programme and improve the ability of players to move evasively with speed : -

- a) angle hop
- b) box jump

**Table 3** Training Schedule under 15 Grades Off-Season

Playing Position	Fitness Components						Total Time Spent
	1A	1B	2	3	4	5	
Tight Forwards	1 hour	—	2hours	—	—	12mins	3h.12m/week
Loose Forwards	1h.20m	—	1h.30m	20mins	—	12mins	3h.22m/week
Inside Backs	1 hour	—	1h.30m	20mins	—	12mins	3h.02m/week
Outside Backs	1 hour	—	1h.30m	20mins	—	12mins	3h.02m/week

Pre-Season

Playing Position	Fitness Components						Total Time Spent
	1A	1B	2	3	4	5	
Tight Forwards	48mins	30mins	1h.20m	20mins	12mins	12mins	3h.34m/week
Loose Forwards	48mins	48mins	1 hour	30mins	12mins	12mins	3h.42m/week
Inside Backs	48mins	24mins	1 hour	30mins	12mins	12mins	3h.18m/week
Outside Backs	48mins	24mins	1 hour	30mins	12mins	12mins	3h.18m/week

In-Season

Playing Position	Fitness Components						Total Time Spent
	1A	1B	2	3	4	5	
Tight Forwards	48mins	24mins	1 hour	24mins	30mins	12mins	3h.42m/week
Loose Forwards	48mins	36mins	1 hour	24mins	30mins	12mins	3h.54m/week
Inside Backs	48mins	24mins	48mins	30mins	20mins	12mins	3h.26m/week
Outside Backs	48mins	24mins	48mins	30mins	24mins	12mins	3h.30m/week

Fitness Components Key:

- 1A = General Endurance
- 1B = Specific Endurance
- 2 = Strength

- 3 = Speed
- 4 = Power
- 5 = Flexibility
- 6 = Agility

**Table 4** Training Schedule under 16 to under 19 Grades  
Off-Season

Playing Position Jersey Numbers	Fitness Components						Total Time Spent	
	1A	1B	2	3	4	5		6
1 and 3	1 hour	—	3hours	—	—	12mins	—	4h.12m/week
2	1h.30m	—	3hours	—	—	12mins	—	4h.42m/week
4 and 5	1h.30m	—	2h.30m	—	—	12mins	—	4h.12m/week
6, 7 and 8	2hours	—	2hours	20mins	—	20mins	—	4h.40m/week
9	2hours	—	2hours	20mins	—	20mins	—	4h.40m/week
10	2hours	—	1h.30m	20mins	—	20mins	—	4h.10m/week
11 and 14	2hours	—	2hours	30mins	—	20mins	—	4h.50m/week
12, 13 and 15	2hours	—	1h.30m	30mins	—	30mins	—	4h.20m/week

Fitness Components Key:

1A = General Endurance  
1B = Specific Endurance  
2 = Strength

3 = Speed  
4 = Power  
5 = Flexibility  
6 = Agility

**Table 5** Training Schedule under 16 to under 19 Grades  
Pre-Season

Playing Position Jersey Numbers	Fitness Components						Total Time Spent	
	1A	1B	2	3	4	5		6
1 and 3	1 hour	20mins	2h.30m	20mins	20mins	20mins	12mins	5h.02m/week
2	1h.30m	20mins	2h.30m	20mins	20mins	12mins	20mins	5h.24m/week
4 and 5	1h.30m	20mins	2h.30m	20mins	20mins	20mins	12mins	5h.32m/week
6, 7 and 8	1h.30m	12mins	1h.30m	30mins	12mins	24mins	20mins	4h.38m/week
9	1h.30m	12mins	1 hour	30mins	12mins	24mins	20mins	4h.08m/week
10	1h.30m	—	1 hour	30mins	12mins	24mins	20mins	3h.56m/week
11 and 14	1 hour	—	1 hour	42mins	20mins	30mins	30mins	4h.02m/week
12, 13 and 15	1 hour	—	1 hour	42mins	20mins	30mins	30mins	4h.02m/week

Fitness Components Key:

1A = General Endurance  
1B = Specific Endurance  
2 = Strength

3 = Speed  
4 = Power  
5 = Flexibility  
6 = Agility

**Table 6** Training Schedule under 16 to under 19 Grades In-Season

Playing Position Jersey Numbers	Fitness Components						Total Time Spent	
	1A	1B	2	3	4	5		6
1 and 3	1 hour	30mins	1h.30m	30mins	42mins	24mins	20mins	4h.56m/week
2	1 hour	30mins	1h.30m	30mins	30mins	24mins	20mins	4h.44m/week
4 and 5	1 hour	30mins	1h.30m	30mins	36mins	24mins	20mins	4h.50m/week
6, 7 and 8	1h.30m	30mins	1 hour	1 hour	20mins	24mins	20mins	5h.04m/week
9	1 hour	30mins	1 hour	30mins	20mins	24mins	30mins	4h.14m/week
10	1 hour	30mins	1 hour	1 hour	20mins	24mins	30mins	4h.44m/week
11 and 14	1 hour	30mins	1 hour	1h.12m	30mins	30mins	30mins	5h.12m/week
12, 13 and 15	1 hour	30mins	1 hour	1 hour	30mins	24mins	30mins	4h.54m/week

Fitness Components Key:

1A = General Endurance  
1B = Specific Endurance  
2 = Strength

3 = Speed  
4 = Power  
5 = Flexibility  
6 = Agility

**Table 7** Training Schedule under 21 and Open Grade Off-Season

Playing Position Jersey Numbers	Fitness Components						Total Time Spent	
	1A	1B	2	3	4	5		6
1 and 3	1h.30m	—	3h.30m	—	—	12mins	—	5h.12m/week
2	2hours	—	3hours	—	—	12mins	—	5h.12m/week
4 and 5	2hours	—	3hours	—	—	12mins	—	5h.12m/week
6, 7 and 8	2h.30m	—	2h.30m	20mins	—	20mins	—	5h.40m/wook
9	2h.30m	—	2h.30m	20mins	—	20mins	—	5h.40m/weeks
10	2h.30m	—	2hours	20mins	—	20mins	—	5h.10m/week
11 and 14	2h.30m	—	2h.30m	30mins	—	20mins	—	5h.50m/week
12, 13 and 15	2h.30m	—	2hours	30mins	—	20mins	—	5h.20m/week

Fitness Components Key:  
 1A = General Endurance  
 1B = Specific Endurance  
 2 = Strength  
 3 = Speed  
 4 = Power  
 5 = Flexibility  
 6 = Agility

**Table 8** Training Schedule under 21 and Open Grade Pre-Season

Playing Position Jersey Numbers	Fitness Components						Total Time Spent	
	1A	1B	2	3	4	5		6
1 and 3	1h.30m	20mins	3hours	20mins	20mins	20mins	12mins	6h.02m/week
2	2hours	20mins	3hours	20mins	20mins	20mins	12mins	6h.24m/week
4 and 5	2hours	20mins	3hours	20mins	20mins	20mins	12mins	6h.32m/week
6, 7 and 8	2hours	12mins	2hours	30mins	12mins	24mins	20mins	5h.38m/week
9	2hours	12mins	1h.30m	30mins	12mins	24mins	20mins	5h.08m/week
10	2hours	—	1h.30m	30mins	12mins	24mins	20mins	4h.56m/week
11 and 14	1h.30m	—	1h.30m	42mins	20mins	30mins	30mins	5h.02m/week
12, 13 and 15	1h.30m	—	1h.20m	42mins	20mins	30mins	30mins	4h.52m/week

Fitness Components Key:

1A = General Endurance  
1B = Specific Endurance  
2 = Strength

3 = Speed  
4 = Power  
5 = Flexibility  
6 = Agility

**Table 9** Training Schedule under 21 and Open Grade In-Season

Playing Position Jersey Numbers	Fitness Components						Total Time Spent	
	1A	1B	2	3	4	5		6
1 and 3	1 hour	1 hour	2hours	30mins	42mins	24mins	20mins	5h.56m/week
2	1 hour	1 hour	2hours	30mins	30mins	24mins	20mins	5h.44m/week
4 and 5	1 hour	1 hour	2hours	30mins	36mins	24mins	20mins	5h.50m/week
6	1h.30m	1 hour	2hours	1 hour	20mins	24mins	20mins	6h.34m/week
7	1h.30m	1 hour	1h.30m	1 hour	20mins	24mins	20mins	6h.04m/week
8	1h.30m	1 hour	1h.30m	1 hour	30mins	24mins	20mins	6h.14m/week
9	1h.30m	30mins	1h.30m	1 hour	20mins	24mins	30mins	5h.44m/week
10	1h.30m	30mins	1 hour	1h.20m	20mins	24mins	30mins	5h.34m/week
11 and 14	1 hour	30mins	1 hour	1h.42m	42mins	30mins	30mins	5h.54m/week
12 and 13	1 hour	30mins	1 hour	1h.30m	42mins	24mins	30mins	5h.36m/week
15	1 hour	30mins	1 hour	1h.30m	30mins	30mins	24mins	5h.24m/week

Fitness Components Key:

- 1A = General Endurance
- 1B = Specific Endurance
- 2 = Strength

- 3 = Speed
- 4 = Power
- 5 = Flexibility
- 6 = Agility

- c) side hop
- d) ricochets (stairs)
- e) skipping (all combinations)
- f) lateral bound

## 2) Training Schedules

The tables are off-season, pre-season and in-season training schedules for players in all playing positions in the following three age groups : -

- a) under 15 grades
- b) under 16 to under 19 grades
- c) under 21 grades and above

The schedule is based upon a "time spent" principle. Each table shows how much time should be spent on a particular fitness component each week. This will involve 3 hours to 6 hours 30 minutes of fitness training each week depending on the grade of the players. During the season this training should become part of the normal team training sessions and not be additional to them.

## 2. Fitness Training Programmes Established by Australia Rugby Union<sup>(1)</sup>

### 1) Fitness Test

#### A. Performance

There are four major factors which underlie a player's performance in a particular rugby task :

- a. Body structure-height, weight, body build, size of heart, proportions of different types of muscle fibers, etc., most of which are largely inherited characteristics.
- b. Fitness or level of physical conditioning-ability of the various systems of the body to function at a high level ; particularly dependent on stage of training.
- c. Skills-ability to perform appropriate tasks at appropriate times with a minimum of error, either individually or in co-ordination with other participants. It is governed by influences like practice, concentration and fatigue.

- d. Psychological factors-motivation, concentration, anxiety, level of arousal, confidence, all affected by internal and external factors such as freedom from injury, fatigue, rewards barracking familiarity with situations.

**B. Components of fitness**

- a. Aerobic power
- b. Anaerobic power
- c. Strength
- d. Speed
- e. Flexibility-suppleness, mobility
- f. Agility

**C. Body Composition**

High levels of body fat are associated with decrements in the performance capabilities of athletes. When discussing the "normal" population, we are looking at fat levels of around 15%. When looking at athletes of virtually all sports, these "normal" levels of fat are excessive when contemplating high levels of performance and low body fat levels are a prerequisite to elite performance.

**D. Tests**

- a. Body composition  
Skinfolds-8 sites including Triceps, Subscapular, Calf, Biceps, Suprailiac, Abdomen, Thigh and Axilla.
- b. Flexibility Tests  
Sit and Reach Test
- c. Vertical Jump
- d. Shuttle
- e. Anaerobic Field Tests-65 meter sprint
- f. Aerobic Endurance-5000 meter run
- g. Strength Test-Universal Weight Machine

**2) Fitness Programmes**

**A. Training Schedule**

The weekly schedule of an average pre-season training period of two months.

**Table 10**

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Morning	—	Endurance runs		Varied pace runs			Speed Endurance runs
Afternoon	—	Weights	Speed training	Weights	Endurance runs	Weights	

**B. Training Factors**

## a. Strength Training-Weight Training

**Table 11**

<i>Strength Type</i>	<i>% Max.</i>	<i>Repetitions</i>	<i>Sets</i>	<i>Rest</i>
Maximum Strength	90%	1- 3	4 - 8	2-4 mins.
Dynamic Strength	75%	8-10	3 - 4	1½-2 mins.
Strength Endurance	50%	10-15	3 - 4	45-90 secs.
Speed Endurance	30%	10-20	2 - 3	45-90 secs.

**b. Endurance Training**

(1) Long Steady Runs

(2) Varied Pace Runs

**c. Speed Endurance Training**

This consists of running a set distance a number of times with a set 3-minute period for recovery.

(1) 6 \* 400 meters

(2) 8 \* 300 meters

(3) 12 \* 200 meters

(4) 1 \* 600 meters plus 3 \* 400 meters, plus 4 \* 200 meters

**d. Speed Training**

(1) Pick-ups : Divide a distance of at least 100 meters into three parts. Run the 100 meters in this fashion : -

a) First part at full effort.

b) Relax in middle section but not let speed decrease below three-quarter speed.

- c) Pick up again in last section to full speed.
- d) For recovery after each effort, walk 100 meters.
- (2) Similar exercise over 150 meters or 200 meters with
  - a) Half-speed for first part
  - b) Flat-out for second part
  - c) Back to half-speed for third part but don't slow down completely. Maintain at least half-speed all the way to finish.
- (3) Players with slow leg speed should benefit from downhill running, not a very steep slope, but one where they will be moving faster than they would on the flat.
- (4) Stadium stairs. Up two at a time jog down one at a time. It's not always easy to find a suitable stadium but if you can, this is also a great leg strengthener.

#### e. Plyometrics

Plyometrics will help player produce instant explosion and is applicable to lineout jumping, scrum shoving and kicking. It comprises a negative movement followed by a positive movement in quick succession where the stretch reflex action is used to generate the positive movement. This is naturally achieved on a full extension but can be consciously brought about in mid range by a very fast negative movement-e. g. in a depth jump or a clap-pressure where you let yourself fall as quickly as possible.

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