



# FACT SHEET

## Monitoring Body Composition

To assess the effectiveness of training or game readiness, athletes typically have an array of fitness traits monitored; the tests of choice varying with the sport. Part of this package often includes an assessment of physique traits or body composition. The specific physique trait and its importance to competitive success varies with the sport, and sometimes the specific player position. For athletes involved in aesthetically judged sports (such as gymnastics and diving), maintenance of lower body fat levels are important for appearance standards of the sport and biomechanical efficiency during routines. In weight bearing endurance sports like running, race walking and cycling, lower body fat levels help to enhance efficiency and heat dissipation while in weight division sports like rowing and boxing, lower body fat levels help to enhance power to weight ratio, offering a performance advantage over smaller, less muscular opponents. In contrast, among athletes in sports demanding high strength and power, muscle mass may be more closely associated with competitive success than body fat. Likewise, in sports like rowing and kayaking, other physique traits like arm and leg length are related to competitive success, with such information used successfully in talent identification.

### Tools of the Trade

A wide array of techniques are available for the assessment of physique traits, from the 'field ready' measurement of anthropometric traits like subcutaneous skinfold thickness ('skinfolds') and girths to more clinic focused techniques like Dual X-Ray Absorptiometry (DXA) or bioelectrical impedance (BIA). When deciding on which technique to use, several issues should be considered, including required accuracy, reliability, expense, safety, portability, invasiveness and technical expertise necessary to conduct the procedures. Given that some athletes can be very tall or muscular, often with very low body fat levels, 'athlete friendliness' of the tool must also be considered. Despite DXA and BIA offering greater insight into absolute measures of fat mass and muscle mass, the routine monitoring of body composition among athletes at sports institutes across Australia is the measurement of skinfolds at several anatomically identified sites on the body; seven sites (triceps, subscapular, biceps, supraspinale, abdominal, front thigh, medial calf) are chosen as this accounts for individual variation in body fat distribution. Furthermore, skinfolds are a very robust measure, not being influenced by factors such as time of day, food and fluid intake or hydration status, variables that can impact on results from other body composition assessment tools. While it is tempting to convert skinfold data into estimates of absolute or percentage body fat, the equations used in this process are

typically derived from non-athletic populations, lacking the resolution to be able to predict individual athlete physique traits with any accuracy. Nor have they been validated to predict change in body composition. As such, results are typically presented as a 'sum of skinfolds'.

### What do the numbers mean?

Table 1 provides some normative data for skinfolds across a range of sports among both males and females, as well as junior and senior athletes. This data is provided as an example of the range in skinfolds across (and within) sports and gender. It should not be used to determine a skinfold 'cut-off' for an athlete or sport, acknowledging that body composition is influenced by an array of factors, including genetics.

Table 1.1 Normative data for sum of seven skinfolds among national and international level male athletes.

Sport	Position/event	Skinfold Sum (mm)	
		Mean	Range
Athletics <sup>1</sup>	SASI Sprint	56.1 ± 2.2	53.9 - 58.3
	SASI Middle Distance	38.6 ± 12.0	25.8 - 68.2
	SASI Long Distance	49.8 ± 6.4	41.3 - 56.4
	AFL <sup>1</sup>	67.2 ± 6.9	44.7 - 104.1
Boxing <sup>1</sup>		57.5 ± 17.7	34.2 - 95.2
Cricket <sup>1</sup>		77.8 ± 23.0	52.3 - 135.2
Cycling <sup>1</sup>	Road	58.1 ± 11.9	42.9 - 85.0
	Track	53.9 ± 12.7	26.4 - 85.3
Gymnastics <sup>1</sup>	SASI Elite	41.6 ± 7.2	27.5 - 59.1
Hockey <sup>1</sup>	Under 21 squad	59.4 ± 17.0	38.7 - 107.2
Kayaking <sup>1</sup>	SASI Senior	58.0 ± 14.0	37.4 - 96.7
Rowing <sup>1</sup>	SASI Lightweight	45.2 ± 6.5	35.8 - 65.1
	SASI Heavyweight	66.9 ± 18.0	46.1 - 111.8
Rugby Union <sup>1</sup>	SASI Senior	92.2 ± 32.9	50.6 - 223.2
Volleyball <sup>1</sup>	SASI Senior	56.8 ± 13.2	36.9 - 79.6
Weightlifting <sup>1</sup>	SASI Squad	74.9 ± 34.4	33.9 - 190.2

*1Adapted with permission from the South Australian Sports Institute (SASI) and published previously by Woolford et al. 1993*

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**Table 1.2 Normative data for sum of seven skinfolds among national and international level female athletes.**

Sport	Position/ event	Skinfold Sum (mm)	
		Mean	Range
Athletics <sup>1</sup>	SASI Jumps	61.1 ± 12.7	41.7 - 72.8
	SASI Throws	95.3 ± 49.4	53.0 - 203.7
	SASI Sprint	60.3 ± 11.9	45.1 - 83.9
	SASI Middle Distance	59.2 ± 19.6	37.4 - 110.6
	SASI Long Distance	51.3 ± 8.8	40.4 - 68.3
Cricket <sup>1</sup>		90.8 ± 19.7	55.9 - 141.1
Cycling, Road <sup>1</sup>		61.9 ± 12.0	33.8 - 89.5
Gymnastics <sup>1</sup>	SASI Elite	37.9 ± 6.1	27.4 - 57.6
Hockey <sup>1</sup>	SASI Senior	87.4 ± 18.5	48.1 - 140.3
Netball <sup>1</sup>	SA Senior	83.4 ± 17.3	51.5 - 124.0
Rowing <sup>1</sup>	SASI lightweight	73.4 ± 13.4	55.5 - 105.2
	SASI heavyweight	87.5 ± 17.8	60.7 - 119.4
Volleyball <sup>1</sup>	SASI Senior	90.5 ± 25.1	35.8 - 147.1

<sup>1</sup>Adapted with permission from the South Australian Sports Institute (SASI) and published previously by Woolford et al. 1993.

In general, an increase in skinfolds is associated with an increase in body fat while a decrease in skinfolds is a reflection of a reduction in body fat stores. To better understand absolute changes in body composition, skinfolds are typically assessed in conjunction with body mass. This offers an insight into changes in both body fat and muscle mass, as indicated in Table 2.

**Table 2. Interpretation of changes in physique traits based on skinfold and body mass data.**

Anthropometric Trait	Interpretation		
	Body Mass*	Skinfolds	Muscle Mass
Increase	Stable	Gain	No change
Decrease	Stable	Loss	No change
Stable	Increase	Loss	Gain
Stable	Decrease	Gain	Loss
Increase	Increase	Potential Gain	Gain
Increase	Decrease	Gain	Loss
Decrease	Increase	Loss	Gain
Decrease	Decrease	Potential Loss	Loss

<sup>1</sup>Adapted with permission from Clinical Sports Nutrition 3<sup>rd</sup> Edition published by McGraw Hill 2006.

Given that body mass is influenced acutely by hydration status and can vary throughout the day by 1-2 kg (typically heavier as the day progresses), body mass measurement should occur at the same time of day, preferably soon after waking and voiding. An assessment of hydration status may also be useful when attempting to interpret changes in body composition.

As with any test, the real value in measurement of skinfolds is with longitudinal monitoring. However, there is always a margin of 'error' with the use of skinfolds and other body composition assessment tools. Having an understanding of this 'technical error of measurement' (TEM) helps to assess if a real change in body composition has occurred. As such, skinfold results are often presented as a range rather than an absolute figure. If the skinfold range from your last assessment doesn't include the range from your existing test then we can be confident a real change has occurred. See the example below on how to interpret results...

An athlete has their skinfolds taken by an accredited anthropometrist with a TEM of 3%

Test 1 in January Sum of 7 skinfolds = 55.0 ± 1.6\* mm (53.4 – 56.6 mm)

Test 2 in March Sum of 7 skinfolds = 50.0 ± 1.5\* mm (48.5 – 51.5 mm)

Test 3 in May Sum of 7 skinfolds = 48.5 ± 1.5\* mm (47.0 – 50.0 mm)

As the range for Test 2 does not overlap the range for Test 1, we can be sure of a significant decrease in skinfolds between January and March. However, as the range for Test 3 overlaps with the range from Test 2, we conclude that skinfolds have remained stable between March and May despite the values differing slightly.

\* The range is calculated by multiplying the measured value by the testers TEM. In the above case this was 3% i.e. 55 mm x 0.03 = 1.6 mm.

## Summary

Body composition is just one of an array of 'fitness traits' that may contribute to the overall success of an athlete. As such, the association between physique traits and competitive success should not be over emphasized.

Sports dietitians have specialist training in anthropometry and, if required, can also guide you on changing your body composition to help maximise your performance. Please refer to other SDA fact sheets for more information on weight loss visit

[www.sportsdietitians.com.au/asset/1/upload/Fact\\_sheet\\_4.pdf](http://www.sportsdietitians.com.au/asset/1/upload/Fact_sheet_4.pdf) and weight gain visit

[www.sportsdietitians.com.au/asset/1/upload/f15-Increasing\\_Muscle\\_Mass.pdf](http://www.sportsdietitians.com.au/asset/1/upload/f15-Increasing_Muscle_Mass.pdf).

Repeat measurements are preferred to assist in monitoring changes in physique traits over time, with assessments always being undertaken by the same anthropometrist. The frequency of assessment may vary depending on the athlete, with more regular tests recommended when actively attempting to modify body composition e.g. decreasing body fat or increasing muscle mass. However, skinfolds should not be assessed more frequently than every 3-4 weeks.