

MORPHOLOGICAL EVOLUTION OF SPRINGBOK RUGBY PLAYERS: IMPLICATIONS FOR RACIAL TRANSFORMATION IN SOUTH AFRICAN RUGBY

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ABSTRACT

The physique of rugby players has evolved over the course of the Twentieth Century. A novel morphological dataset was constructed of all Springbok rugby players until 2014. Although most of the change in body structure, particularly body weight, occurs during the era of professionalism, white Springbok rugby players always were found to have been taller and heavier than the average white South African male. Black Springbok rugby players, although shorter than their white counterparts, are much taller than the average black South African male. Since success in rugby depends very largely on physique, the findings have implications for racial transformation in South African rugby. The physique of South African Springboks were also compared with the physique of players in the New Zealand and England national teams.

Keywords: South Africa; Sport economics; Rugby; Biological living standards; Morphological evolution.

INTRODUCTION

*Rugby is a sport where big, strong and fast people excel and
if you don't start off with those attributes you are just going to struggle...*

Nick Mallett (Rich, 2007:online)

Sportsmen's physique has evolved over the course of the Twentieth Century. Rugby in particular has seen some of the largest increases in height and weight (Olds, 2001). There are several reasons for this change. Overall levels of health in the general population have increased markedly, owing to higher incomes, better nutrition and a healthier environment (Baten & Blum, 2012). Also, the impact of professionalism in Rugby Union during the 1990s has resulted in athletes being able to commit to full-time training (Norton & Olds, 2001; Smart *et al.*, 2014).

The purpose here is not to dispute these stylised facts. There is a body of scientific literature that documents the physical requirements of professional rugby union players (Nicholas, 1997; Reilly, 1997; Eaves & Hughes, 2003; Austin *et al.*, 2011). Instead, using a new dataset of Springbok rugby players, the evolution of morphological characteristics of rugby union players selected for the South African national team is documented. Height, or stature, is widely used as a proxy for the measurement of living standards over time. An abundance of evidence from across the globe supports the notion that better early childhood nutrition and living conditions (including a less adverse disease environment) reinforces growth and leads to taller adults, on

average (Komlos, 1994; Steckel, 1995; Baten & Blum, 2012). For that reason, height has been studied in many settings, including professional sport teams (Norton & Olds, 2001).

The contribution made with the current study is to document the increase in height and weight of Springbok rugby players over the Twentieth Century and use simple regression analysis to explain the correlates of this increase. For the first time, the increase in the heights of Springbok players with the increase in the general population is compared. The difference between white and black Springbok players is also shown, noting that it is smaller than the national average difference between white and black people. This may suggest a reason for the slow racial transformation of professional rugby. Whereas white Springbok players are only one standard deviation above the national average, black Springbok players are two to three standard deviations above it. The pool of black Springbok players who are likely to qualify for professional rugby is thus much smaller than generally thought.

The South African experience is compared with that of New Zealand, a country that shares South Africa's history of colonialism and exclusion. Racial transformation of rugby in New Zealand happened much faster once the average height of New Zealand's Maori population reached the level of its Pakeha (white) population (Inwood *et al.*, 2016).¹ The implication is that South African rugby will remain largely untransformed until the living standards of black South Africans are improved, assuming no change in future rugby tactics. As the South African Sevens team has shown, height need not be a barrier to success.

EVOLUTION OF THE SPRINGBOK RUGBY PLAYER

The average height of Springbok rugby players increased over the Twentieth Century. The 23 players who made their debuts for the Springboks between 1903 and 1906 were on average 179cm tall. In contrast, the 50 players who made their debuts between 2010 and 2014 were on average 187cm tall, an increase of 0.72cm per decade. This is comparable with the finding by Olds (2001) that there had been an increase of 1cm per decade for Scottish players between 1905 and 1999. The Springboks' increase is shown in Figure 1, which plots all 543 players in the Twentieth Century with a linearly fitted line.² An even bigger increase over time can be seen in weight of players (Figure 2). Whereas debutants in the first decade of the Twentieth Century weighed 80.0kg on average, their counterparts in the second decade of the Twenty-first Century weighed 104.4kg, an increase of 24kg or 2.2kg per decade. This is also comparable to the finding by Olds (2001) of an increase of 2.6kg per decade for Scottish rugby players during the Twentieth Century. The Springboks' sharpest increase occurs during the era of professionalism, weight being a morphological variable more affected by a player's behaviour during his playing career. Between 1900 and 1980, the weight increase was 12kg. In the three decades since, another 12kg has been added.³

¹ Inwood *et al.* (2016) report that the height of Maoris declined in the 1920s and increased again from the 1950s onwards; similar to the height patterns of the New Zealand rugby players in Figure 3.

² Data was only available for 543 of the 805 Springboks that played between 1903 and 2014. The data was obtained from Wikipedia [Retrieved on 14 September 2016].

³ The Springboks' height and weight increased by 0.94 cm and 2.3 kg, respectively, per decade from 1900 to 1990 that is closer to the findings in Olds (2001).

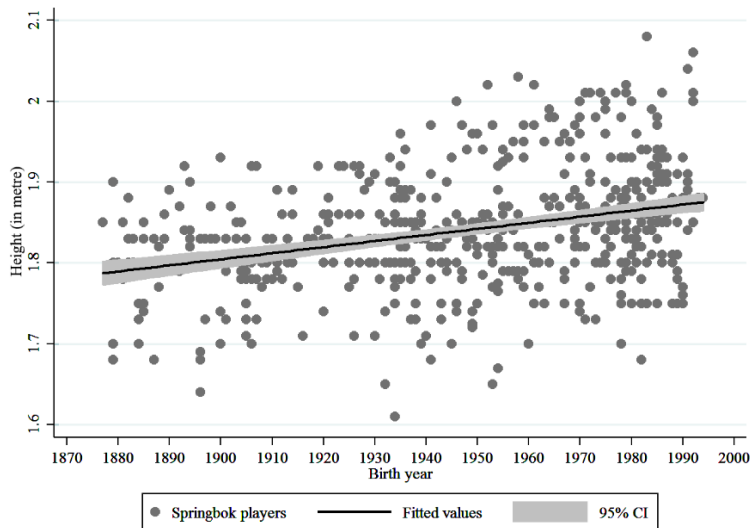


Figure 1. HEIGHT OF SPRINGBOK RUGBY PLAYERS AT YEAR-OF-BIRTH

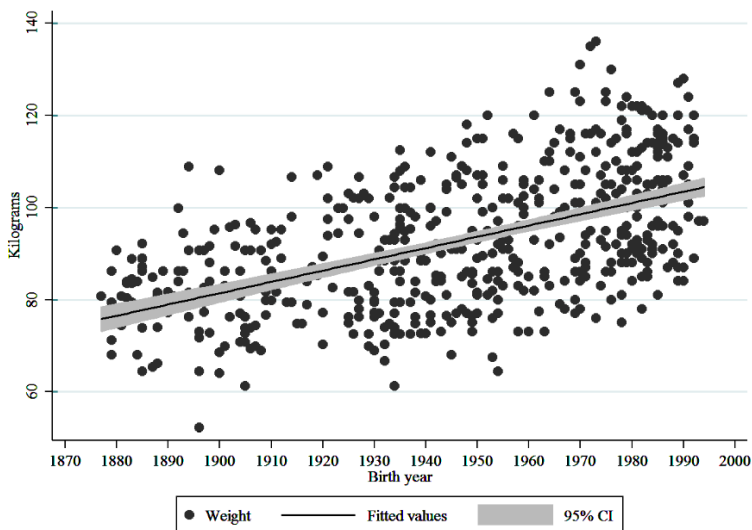


Figure 2. WEIGHT OF SPRINGBOK RUGBY PLAYERS AT YEAR-OF-BIRTH

Simple regression analysis allows investigation of the characteristics in greater detail that correlate most closely with the increase in height. To allow a more precise investigation of the time trends, height and weight were separated instead of combining them in the Body Mass

Index. Table 1 shows the output of four specifications of an Ordinary Least Squares estimation with robust standard errors. The first describes the relationship between weight and height.

Table 1. CORRELATES OF HEIGHT FOR FULL SAMPLE

Variable	Spec (1)		Spec (2)		Spec (3)		Spec (4)	
	Coeff.	t-Stat	Coeff.	t-Stat	Coeff.	t-Stat	Coeff.	t-Stat
Weight	0.004***	19.58						
Age at debut	0.00	-0.10						
Position								
Hooker			-0.020**	-2.98	-0.018*	-2.16	-0.017*	-2.06
Lock			0.111***	12.55	0.114***	15.77	0.112***	15.79
Flanker			0.034***	4.32	0.038***	5.20	0.038***	5.29
Eight-man			0.050***	5.03	0.051***	6.01	0.051***	5.96
Scrumhalf			-0.094***	-9.36	-0.091***	-9.14	-0.091***	-9.27
Flyhalf			-0.051***	-5.09	-0.050***	-5.68	-0.051***	-5.95
Centre			-0.029***	-3.69	-0.021**	-3.12	-0.020**	-2.92
Wing			-0.022**	-3.21	0.013	-1.85	0.007	-1.00
Fullback			-0.030*	-2.55	-0.030**	-2.70	-0.027*	-2.45
Year								
1910					0.018	0.97	0.018	1.00
1920					0.004	0.32	0.004	0.29
1930					0.022	1.65	0.022	1.62
1940					0.030*	2.05	0.031*	2.09
1950					0.031**	2.59	0.031*	2.56
1960					0.033**	2.79	0.033**	2.78
1970					0.040**	3.27	0.040**	3.28
1980					0.056***	4.38	0.057***	4.48
1990					0.072***	6.05	0.075***	6.28
2000					0.075***	6.40	0.086***	7.28
2010					0.071***	5.69	0.082***	6.51
Group								
Coloured							-0.034***	-3.36
Black							-0.040***	-3.61
Constant	1.498***	66.4	1.840***	416.4	1.790***	157.9	1.789***	156.80
R-squared	0.54		0.53		0.64		0.66	
N	543		543		543		543	

Control groups are Props, 1900 and Whites.

Probability levels= * p<0.1, ** p<0.05, *** p<0.01

Spec=Specifications of an Ordinary Least Squares estimation with robust standard errors Source: Own calculations

As expected, there is a strong positive correlation. Firstly, height as the dependent variable is the focus, while including the players' age at debut. Age seems to have no effect on height, in other words, younger debutants are not shorter than older debutants. To continue the analysis, the variables *weight* and *age at debut* are thus excluded.

Specification 2 includes a series of controls for the position of the player. Props (the numbers 1 and 3 in a rugby team) is the reference group. The coefficients should thus be read as the additional height (dis)advantage that a player's position has over props. Hookers are a statistically significant 2cm shorter, for example, while locks are, predictably, a statistically significant 11cm taller. Backline players are generally shorter than props, namely scrumhalves (9cm shorter), flyhalves (5cm), centres (3cm), wings (2cm), and fullbacks (3cm).

These time-invariant differences mask considerable change over the Twentieth Century. Figure 3 shows the height of Springbok hookers and locks who made their debut during the Twentieth Century. While the height of hookers have remained constant for a century (at around 183 cm), the heights of locks have increased from being statistically indistinguishable from those of hookers at the start of the twentieth century to above 2 metres by the final decade. This provides early evidence that changes in rugby strategy have affected the selection criteria for these positions.

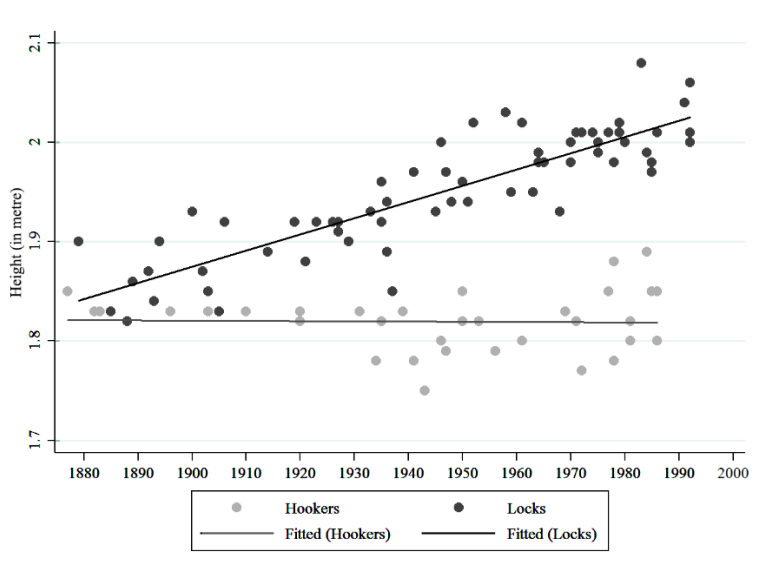


Figure 3. HEIGHT OF SPRINGBOK HOOKERS AND LOCKS AT YEAR-OF-BIRTH

Specification 3 in Table 1 adds another control variable, time dummies. A decade dummy for the year a player made his debut is created. This is different from the Figure 1 and 2, which report the year in which a player was born. Players who represented the Springboks in the first decade of the twentieth century (1900s) is the reference group.

The time dummies clearly show an increase in height, while controlling for position, over the Twentieth Century. In the final decade, for example, players are 7.1cm taller than debutants in the 1900s, *ceteris paribus*. Interestingly, while there is a constant increase throughout most of the Twentieth Century, the increase has halted over the last three decades, which coincides with the era of professionalism. As will be shown below, these trends also reflect the broader changes in society.

The final specification includes another dummy variable, namely race. Here the reference group is white players being more than 90% of the total population of players. The two other race groups, Coloured and black, make up only 5.7% and 3.5% of this population respectively, having played for South Africa generally since the country was readmitted to international competition in 1992.⁴ The average again masks some diversity across positions. While South Africa has never selected a Coloured hooker, 8.8% of hookers have been black, more than twice the average for all black debutants.

Specification 4 in Table 1 shows that Coloured and black players selected to play for the Springboks have been shorter than their white counterparts. Coloured players were on average 3.4cm shorter, while black players were 4 cm shorter. This is a reflection of the racial disparity in heights of the general population, an issue addressed in the next section. A very pertinent question is whether player height matters in determining player outcomes. Although one could consider the percentage of winning and losing games players have taken part in, such an indicator will be affected by the opposition's characteristics, an indicator which by implication changes over time. Instead, a measure is used in this study that captures only the individual's own ability, namely the number of appearances for the Springbok team (Table 2).

Specification 1 clearly shows that height does not predict the number of appearances as the coefficient is statistically insignificant. In specifications not shown, height remains insignificant even if additional controls are included. Instead, weight seems to be important as a determinant of the length of a player's career where an additional kilogram, *ceteris paribus*, adds roughly 0.4 additional caps (test matches played). Although not shown in Table 2, weight remains a significant factor even after controlling for Springboks, who made their debut after 1992.

The likely reason why height is a less important explanatory variable than weight is the combination of the two trends described above being the increase in weight (but not height) during the professional era and the increase in the number of caps during the professional era. Specifications 2 to 5 in Table 2 thus include weight instead of height as the explanatory variable, while adding additional control variables, such as age at debut, position, race and time dummies.

Understandably, players who make their debut at a younger age are also likely to play more games. Only the two positions, scrumhalf and fullback, are likely to have more caps than props that is the reference category. The era of professionalism can be clearly seen in the large, positive coefficients of the 1990 and 2000 dummies, when the greater number of matches also meant the best players had more opportunities to collect caps.

⁴ Only two coloured players played for South Africa before 1992, E.G. Tobias and A.P. Williams.

Table 2. CORRELATES OF CAPS FOR FULL SAMPLE

Variable	Spec (1)		Spec (2)		Spec (3)		Spec (4)		Spec (5)	
	Coeff.	t-Stat	Coeff.	t-Stat	Coeff.	t-Stat	Coeff.	t-Stat	Coeff.	t-Stat
Height	8.227	0.56								
Weight	0.357***	4.81	0.427***	8.94	0.732***	8.91	0.737***	8.58	0.393**	3.25
Age at debut			-2.019***	-7.99	-1.642***	-7.02	-1.660***	-7.07	-1.800***	-7.51
Position										
Hooker					9.739**	2.67	10.053**	2.75	6.471	1.74
Lock					1.634	0.54	1.325	0.43	1.847	0.63
Flanker					4.595	1.92	4.554	1.88	2.394	1.04
Eight-man					5.669*	2.27	5.553*	2.22	2.995	1.20
Scrumhalf					20.100***	5.23	19.849***	5.05	9.853*	2.32
Flyhalf					15.555***	4.67	15.292***	4.48	6.092	1.59
Centre					12.959***	4.40	12.821***	4.22	5.002	1.52
Wing					11.786***	4.13	11.889***	4.32	4.832	1.70
Fullback					18.443***	4.58	18.000***	4.22	9.510*	2.14
Group										
Coloured							1.556	0.35	-1.416	-0.33
Black							-6.163	-1.84	-10.387*	-2.56

Control groups are Props, 1900 and Whites.
Probability levels= * p<0.1, ** p<0.05, *** p<0.01

Spec=Specifications of an Ordinary Least Squares estimation with robust standard errors
Source: Own calculations

Continued...

Table 2. CORRELATES OF CAPS FOR FULL SAMPLE (cont.)

Variable	Spec (1)		Spec (2)		Spec (3)		Spec (4)		Spec (5)	
	Coeff.	t-Stat	Coeff.	t-Stat	Coeff.	t-Stat	Coeff.	t-Stat	Coeff.	t-Stat
Year										
1910									4.156*	2.59
1920									4.990**	3.17
1930									1.725	1.07
1940									8.752***	4.11
1950									4.666**	2.77
1960									8.996***	4.65
1970									2.992	1.58
1980									5.755**	2.85
1990									19.779***	6.02
2000									18.957***	4.57
2010									1.975	0.59
Constant	-35.008	-1.55	23.625**	3.23	-22.842**	-2.76	-22.659**	-2.60	8.618	0.74
R-squared	0.100		0.195		0.256		0.260		0.368	
N	543		543		543		543		543	

Control groups are Props, 1900 and Whites.

Probability levels= * p<0.1, ** p<0.05, *** p<0.01

Spec=Specifications of an Ordinary Least Squares estimation with robust standard errors

Source: Own calculations

In short, then, the evidence in this study shows that the heights and weights of Springbok rugby players have greatly increased over the course of the Twentieth Century. The next section investigates whether this increase is unique to the Springboks, or whether it is also true for South Africa's most formidable competitor, the All Blacks of New Zealand.

SPRINGBOKS COMPARED WITH OTHER TEAMS

These long-run trends support a literature that has investigated the morphological changes of rugby players during the professional era, the 1990s and onwards. Olds (2001) analysed the twentieth-century morphological changes of Scottish rugby players, and Quarrie and Hopkins (2007) analysed morphological changes from 1972 to 2004 in the Bledisloe Cup, a competition between the national teams of Australia and New Zealand. Both studies found a marked increase in the players' average height and weight. Recent literature has shifted the focus to youth development. Lombard *et al.* (2015) investigated the morphological characteristics of under-20 South African rugby players from 1998 to 2010. They found that "the players got heavier, slightly taller, stronger and faster over the 13 years of the study" (Lombard *et al.*, 2015:986).

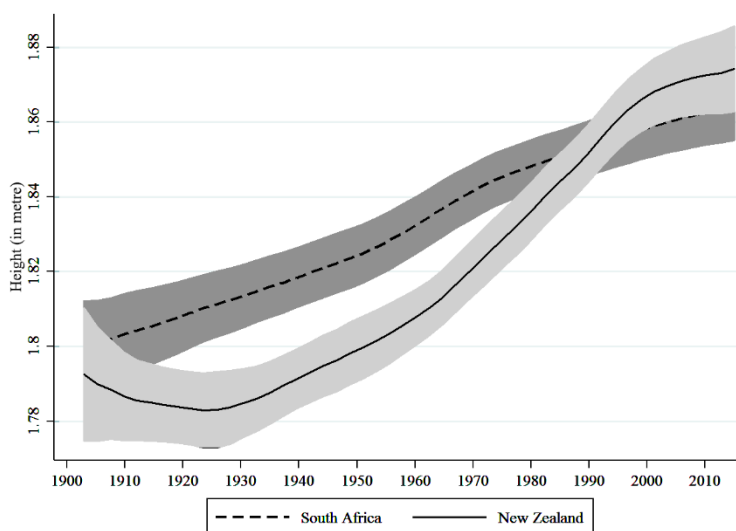


Figure 4. HEIGHT OF SPRINGBOK AND ALL BLACK RUGBY PLAYERS OVER THE TWENTIETH CENTURY

A similar study was recently undertaken for Australian youths, with largely similar results (Patton *et al.*, 2016). Arkell (2015) studied the morphological characteristics of under-16 and under-18 players and found that those selected for the national team were taller and heavier than those not selected. In the current study, the twentieth-century series of the heights and weights of the Springboks are compared with a similar series for New Zealand's All Blacks. As far as could be established, this is the first study to do this for two of the world's most prestigious rugby union teams. Between 1903 and 2014, 814 All Black rugby players made

their debut for New Zealand.⁵ In Figure 4, we compare their heights with those of the Springboks. Note that because of data limitations, the year-of-debut is used on the X-axis instead of the year-of-birth.

Figure 4 shows that most of the twentieth century Springbok rugby players were significantly taller than their All Black counterparts. The gap began to even out during South Africa's era of isolation. During the professional era, the height of All Black players began to surpass their Springbok counterparts, although the difference has not always been statistically significant. The average height of an All Black who made his debut after 1992, the year of readmission for the Springboks, was 187.3cm. In comparison, the average Springbok was 186.8cm.⁶

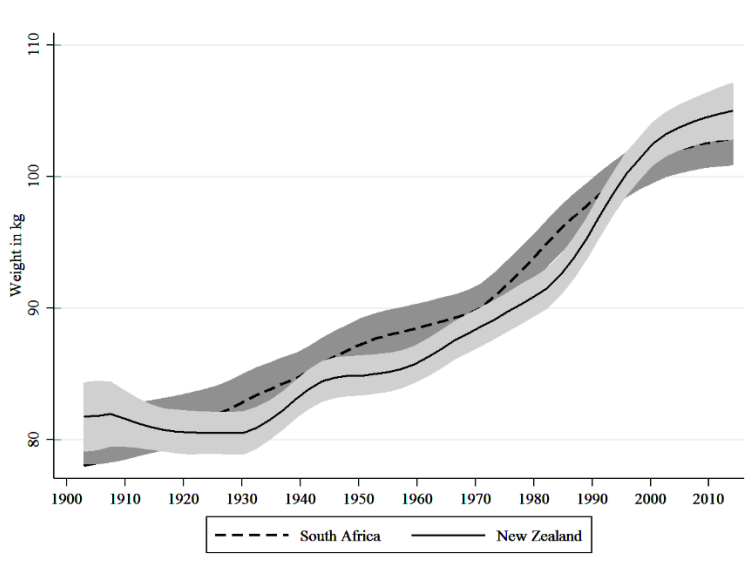


Figure 5. WEIGHT OF SPRINGBOK AND ALL BLACK RUGBY PLAYERS OVER THE TWENTIETH CENTURY

Surprisingly, the same trend for weight differences between the two countries was not observed. Figure 5 plots the evolution of Springbok and All Black weights over the period. Neither country seems to have a consistent advantage. The large difference in heights between the players from these two countries may be as a result of differences in playing tactics. It may also simply be because the (white) South African population is on average taller than the New Zealand population, an issue that is addressed next.

⁵ Data were available for only 814 of the 1137 All Blacks who played between 1903 and 2014.

⁶ The same height average for England's national rugby team players was calculated and found that those who made their debut after 1992 averaged a somewhat lower 185.66 cm.

CHALLENGES OF RACIAL TRANSFORMATION

To compare the heights of the Springboks with those of the general population over the Twentieth Century, the heights of the latter had to be examined. These data are more difficult to obtain than one might imagine. Fortunately, new work on the heights of South Africans over the Twentieth Century made this analysis possible. Two sources were utilised. First, the study of Mpeta *et al.* (2016) was accessed for information on black heights. They use three sources to obtain these data, namely World War II recruits, a data set on cadaver heights and the 2008 National Income Dynamics Study (NIDS) first wave. They discuss at length the possible selection issues in the data. For the information on white heights, recent work by Fourie *et al.* (2014) on white living standards were turned to. Their data come from military attestation forms of World War I recruits, South African Constabulary regiments, Cape Mounted Police recruits and several other military forces. To this we add information on white South Africans from World War II, the cadaver heights and the NIDS (2013).

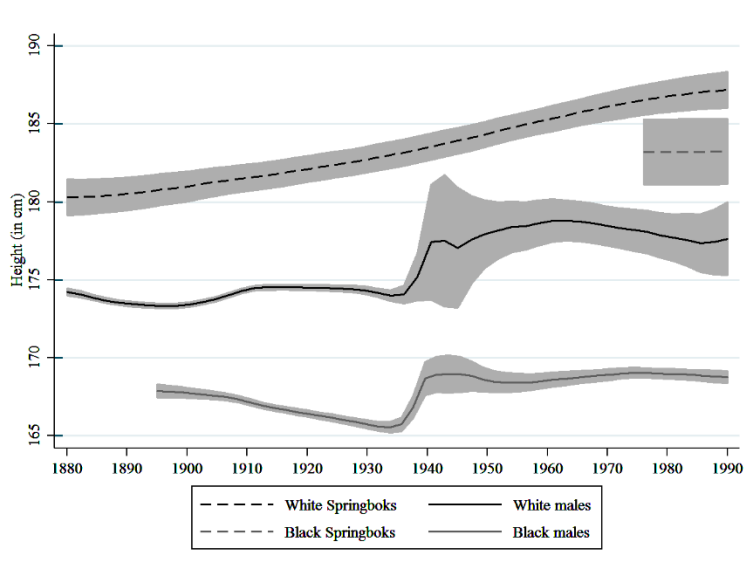


Figure 6. HEIGHT OF SPRINGBOKS AND NATIONAL AVERAGE BY RACE FOR BIRTH YEARS 1880–1990

Figure 6 shows a large difference in heights between white Springboks and the white male population. It is clear that this difference existed from the start of the period, although the gap has widened. For white Springboks born from 1881 to 1890, the gap between their average height and that of the average white male in South Africa born during the same period was approximately 6cm, but for white Springboks born from 1981 to 1990 it was approximately 10cm. This may reflect the pressures of professionalism to choose stronger and bigger players. An even bigger difference exist for black South Africans. There were no black Springbok players at the start of the century, but the gap between the average height of black Springboks at the end of the period and that of the general black male population is an astounding 16cm.

It appears that this height discrepancy is an important factor in preventing more rapid transformation of rugby. The difference between white Springboks and white men in the South African population is roughly one standard deviation, while the difference between black Springboks and black men in the South African population is roughly two standard deviations. Even then, black Springboks are still significantly shorter than white Springboks. The difference between white Springboks and black men is roughly 2.2 standard deviations. To give an example, 55% of white men between the ages of 18 and 30 in NIDS are as tall as the average white Springbok. Only 28% of black men are as tall as this average.

These large morphological differences often hinder attempts to create transformation through specialised programmes. Du Toit *et al.* (2012) investigated the success of transformation programmes in South Africa in speeding the development of black and Coloured rugby players. Analysing the 2007–2011 period, they conclude that little progress was made. It is clear, they argue, “that there are other hurdles that need to be overcome before the effects of the specialised programmes can be realised” (Du Toit *et al.*, 2012:84).

These ‘hurdles’ are primarily socio-economic. There is ample supporting evidence. A study of South African school children found that differences in fitness and morphological characteristics are largely eliminated when the analysis controls for socio-economic status (Armstrong *et al.*, 2011). A more recent study of under 16 and under 18 South African rugby players between 2010 and 2013 found that the white players were heavier and taller than the black and Coloured players and, more importantly, that young players with a high socio-economic status were heavier, taller and had more playing experience than those with a low status (Arkell, 2015). Du Toit *et al.* (2012:84) note that children who start off compromised because of being raised in a poor socio-economic environment “will always have a competitive disadvantage as they grow and mature”.

Table 3. PERCENTAGE OF SPRINGBOKS BY RACE FOR EACH POSITION FOR FULL SAMPLE

Position	Black	Coloured	White
Prop	5.06	2.53	92.41
Hooker	8.82	0.00	91.18
Lock	0.00	1.56	98.44
Flanker	4.17	2.78	93.06
Eight-man	2.70	2.70	94.59
Scrumhalf	0.00	6.82	93.18
Flyhalf	0.00	5.41	94.59
Centre	2.70	6.76	90.54
Wing	8.33	13.89	77.78
Fullback	0.00	16.67	83.33
<i>Total Sample</i>	3.50	5.71	90.79

Socio-economic differences rooted in South Africa's history of exclusion and segregation, and the concomitant disparities in height and weight, prevent the selection of black rugby players, which is supported by the results of the current study. In the modern game, locks are clearly selected for height. It is therefore not surprising that, as Table 3 shows, no black lock has ever played for the Springboks, and only one Coloured lock, Quinton Davids.

It is surprising that no black scrumhalves, flyhalves and fullbacks have been selected for the Springboks, since those are the positions where height is least important (as seen in Table 1, these three positions have the largest negative coefficients). Therefore, the lack of black representation in these positions must have other than purely socio-economic explanations. One may be that players in these positions are often the most skilful in the team. They are positions that require many years of training, and not many young black players have been exposed to rugby at an early age. Of course, there are other constraints holding back rugby transformation. Lack of access to high-quality facilities, good coaches, nutritional advice and supplements, racial biases in selection and the dearth of black role models in rugby (especially before international readmission) are all possible reasons for the low levels of racial transformation (Sailes, 1991).

One possible explanation for the lack of representation of black players in these key positions is the "Anglocentric hypothesis" that is the view that "racial and cultural prejudice [influences] coaching and selection processes in favour of whites in English-speaking countries" (Cros, 2013:156). This hypothesis posits that certain positions, notably those which are more able to influence the outcome of a match, like hooker and fly-half, are more likely to be occupied by whites, while more peripheral positions, like prop and wing, are more likely to be occupied by minority groups, in this case Coloured or black players. Using evidence from test rugby, Super Rugby and the Currie Cup, Cros (2013:167) shows that, apart from the central scrumhalf position, the other three central positions (hooker, number 8 and fly-half) "are overwhelmingly white", with "overall black participation being limited to below 9%". The longer series of test caps in the current study supports this.

A comparison between black and Coloured South Africans might shed some light on this. Coloured South Africans are on average shorter than black South Africans. According to the NIDS sample for this study, the Coloured average is 168.1cm compared to 168.9cm for the black average. The black population is also more than eight times bigger than the Coloured population. Yet, more Coloured players (5.7%) than black players (3.5%) have played for the Springboks. Table 3 indicates that Coloured South Africans tend to be over-represented in the backline. Despite only 6% of all Springbok debutants being Coloured players, 14% of wings and 17% of fullbacks are Coloured.

Cros (2013:171) concedes that the Anglocentric hypothesis cannot fully explain the under-representation of blacks in Springbok teams. He says that "the centrality model cannot account for the fact that blacks are represented above average at the central positions of fullback and scrumhalf while whites enjoy a virtual monopoly at lock and flanker, two peripheral

positions”.⁷ He instead posits as another partial explanation the “high symbolical as much as concrete premium put on *physicality*, which in our view must be considered as a factor of centrality in South African rugby” (our emphasis).

Whether viewed symbolically or concretely, morphological characteristics, as has been shown, matter in Springbok selection. And racial differences in these characteristics, as has been shown here too, have persisted for decades, a consequence of the socio-economic disparities of South Africa’s history. Socio-economic conditions affect children’s early levels of development, which in turn affects their ability to be competitive at a young age and, ultimately, to compete for higher honours. Arkell (2015:87-88) notes that:

Bigger players (predominantly white players) will always have an advantage over the smaller players (black and Coloured players) who have been disadvantaged and in most cases raised in a low socio-economic environment. Transformation is therefore compromised at the youth level of rugby in South Africa. It follows that transformation at the senior level will also be compromised until the differences at the junior level are negated.

While many factors may contribute to the under-representation of coloured and black South Africans in the Springbok team, morphological characteristics determined at a young age by socio-economic circumstances seem to be the most influential.

CONSEQUENCES AND CONCLUSION

The above discussion has focused only on the supply side, with the assumption that the demand for bigger and taller rugby players will remain constant. This is not an entirely valid assumption. Rugby tactics may change. Consider, for example, the considerable differences in football strategy employed by Barcelona and Real Madrid, two of Spain’s best football clubs. While the former tends to select strong and tall players, the latter favours short and skilful players. Their selection is informed by their football philosophy.

The need to rapidly transform rugby in South Africa might necessitate, therefore, a change in strategy. One example of how this might be done can be seen in the performance of the Springbok Sevens team. As Higham *et al.* (2013:25) showed, rugby Sevens players are more homogeneous in morphological characteristics than rugby fifteen: “Irrespective of playing position, all rugby Sevens players require speed, ball-handling skills, change of direction pace, adroit defensive skills, and strength and power to secure the ball in contact situations”.

Since 2000, 87 players have made their debut for the Springbok Sevens team, 53% of them white, 30% of them Coloured and 17% of them black. This team is clearly a more racially transformed team than the Springboks. Yet here, too, morphological differences are evident where Coloured players are the shortest at 1.8m, while black players are on average 1.82m and white players 1.85m. But the team has remained successful⁸ with an average height of 1.83cm

⁷ Cros (2013) does not distinguish between Coloured and black; he groups them together under black. The scrumhalves he refers to are Coloured.

⁸ One example is the bronze medal the team won at the 2016 Olympic Games.

despite its rivals, New Zealand, measuring an average 1.86cm for the 61 debutants over the same period. This, one would argue, is partly the nature of Sevens rugby (where physicality is less instrumental in success), but also possibly a result of the tactical change that South African Sevens coaches adopted to accommodate the shorter South African players.

Whether this same approach could be applied to the fifteen-man format is not clear. For instance, studies have shown that there is a correlation between success in the Rugby World Cup and the physique of the competing teams, that is, bigger teams are more successful than smaller teams (Olds, 2001; Sedeaud *et al.*, 2012). The fear that the increasingly physical requirements of rugby may continue to marginalise some groups is relevant not only in South Africa, but also elsewhere. Sedeaud *et al.* (2013) analysed the change in the morphological characteristics of rugby players in the French league between the 1980s (before professionalism) and the 2000s (after professionalism) and found a pronounced increase in height and weight. They conclude that although these players initially reflected the morphological distribution of France's general population, rugby in France has progressively evolved into a sport "associated with strong physical stereotypes for players which are not representative of the general population". They suggest that the quest to recruit "suitable morphologies and profiles" could lead to an increase in non-native players with "appropriate morphological traits" in French championship teams (Sedeaud *et al.*, 2013:185).

The unrepresentative physique of rugby players is also of concern in South Africa. In this paper, it has been argued that if Springbok rugby players continue to be selected on height, then racial transformation will continue to be slow. Despite that the living standards of black South Africans have increased dramatically since the start of democracy, the gap between white and black South Africans remains large. It is possible, though, that the standard deviation within race groups is increasing, meaning that more players will become eligible to play for the Springboks despite the average remaining constant (or growing slowly).

An alternative route to follow would be to adjust rugby tactics to suit the different morphological characteristics of the South African population. Such tactics would change the selection policy from one based largely on height and weight to one that could include other characteristics that might be more central to success. This will require innovative and creative coaching. It is predicted that racial transformation will remain a headache for as long as the focus remains on the supply side.

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