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## AGE VS WEIGHT CATEGORY RUGBY

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# *AGE-GROUP VS. WEIGHT GROUP RUGBY*

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## INTRODUCTION

The increased competitiveness of schoolboy rugby has resulted in the players becoming bigger and stronger. For example, the average body mass of players at Craven Week has increased by 10 kg (6.6%) since 1968[14]. This increase in body mass can be attributed to resistance training. Indeed, the players at Craven Week who engage in resistance training are on average about 8 kg heavier than the players that do not do any resistance training[8]. Furthermore, the average bodyweight of the boys that are selected for the South African Schools team at the end of the Craven Week tournament is also about 8 kg heavier than the average weight of the boys who do not make the team[8]. It is clear that the heavier players have a competitive advantage, or from another perspective, one can argue that the smaller players are at a disadvantage when it comes to being selected for high-level teams.

Another factor which accounts for varying sizes amongst players of the same age is the different rates of development, particularly the onset of puberty. This has been discussed in more detail in another paper[13]. The main points arising from this paper were:

- schoolboy rugby players are becoming bigger and stronger
- the size difference between the elite and average adolescent player is also increasing
- late developers may be lost to the game if they are not properly managed
- the disparity in body size before, during and after puberty may increase the risk of injury

These findings result in two possible scenarios for smaller players. Firstly, the smaller, talented players will choose sports in which they can express their talent and not be limited by their lack of size, as would be the case in rugby. This option would result in much talent being lost to rugby. Some players in this group may be late developers, who possess superior skills associated with success in rugby. However, despite possessing skills, these players may be overlooked because of their lack of size at the junior level. If these players are not managed appropriately, their superior skills may not ever have an opportunity to manifest and develop fully. The second scenario is that the smaller players may choose to play rugby but will always be at an increased risk of injury because they will be playing against boys who are bigger and stronger. This raises questions about whether the game needs to be managed differently to cater for these smaller players, particularly during the pre-pubertal years where most of the variation in size exists[13].

There are two possible management strategies which can be considered: either the laws of the game are changed to minimise the impact of varying size during the junior years, or the matches are played with the teams defined by weight group rather than by age group. The goal of having weight, rather than age, categories, at the junior level would be to narrow the size difference which exists in junior players, and provide more opportunities for smaller players to excel. Ostensibly this would provide a better environment for skills development and reduce the risk of injury. An argument for weight

categories has been made before, with a suggestion that there should be an introduction of lightweight competition at the international level, including a lightweight rugby World Cup[19]. This approach would allow countries with smaller people an opportunity to compete equally.

On the negative side, weight categories would detract from the "spirit of the game", which promotes and encourages different sizes and skills for the various playing positions. Therefore the answer to the question of whether rugby should be played according to weight groups at junior level is not a simple one. To provide an evidence-based answer to this question it is necessary to examine the pros and cons of junior rugby played according to either age group or weight group. This evidence needs to be considered according to the risk of injury, physical fitness, skill and cognitive development. Each of these aspects is an important part of the debate and needs to be considered carefully before an evidence-based opinion can be made. The long-term talent models[29] that other top rugby-playing countries (Australia and New Zealand) have adopted for their youth will also be discussed. Finally, recommendations pertaining to the South African situation will be made based on the available evidence.

## *ASPECTS OF MATURITY IN CHILDREN WITH INCREASING AGE*

For the purpose of this discussion maturity can be considered based on physical, motor and cognitive functions. A good player needs to be well developed for his age in all these categories – a deficiency in any category will result in impaired performances. If the player does not have an intuitive coach this will result in lower self-esteem, lower self-confidence and may lead to the player stopping playing rugby or moving to another sport which caters for his physical and psychological needs. The next section will discuss research applicable to physical, motor and cognitive development in the context of maturity of rugby players.

### *Physical development*

The increase in height and mass of South African schoolboys with increasing age (6 to 14 years) is shown in Figure 1. As expected, their body mass and height increased consistently through their developing years up to puberty[5]. The variation in height and mass at each age group is clearly shown by the spread of values around each data point (expressed as standard deviations in Figure 1). For example, a large 10-year-old may have a similar body mass to an average-sized 13-year-old, or a large ten-year old may be more than 20 kg heavy heavier than a smaller boy from the same age group.

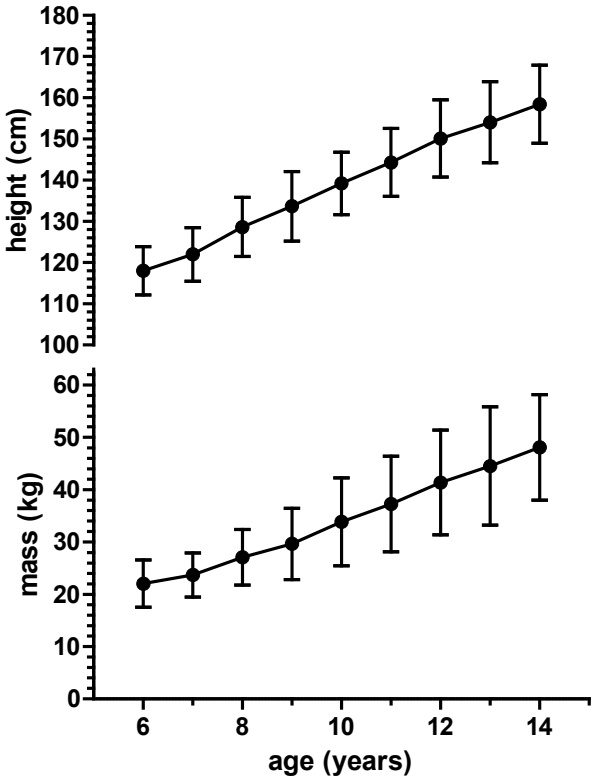


**Figure 1: Height (cm) and body mass (kg) of South African schoolboys (n = 5611). The data are expressed as mean ± standard deviation**

With rugby competition at school in South Africa being defined by age group, it is quite common to see boys with these large differences in mass and height competing against one another. These differences are at their greatest during the pre-pubertal, pubertal and post-pubertal period, which spans about 5 years (14 to 19 years). It is clear the players who mature earlier are at a distinct advantage, particularly in a sport such as rugby which is dependent on size. Indeed, it has also been shown in other sports, such as soccer, that elite adolescent players were mostly early maturers, and that late maturers were either relegated to lower teams or migrated to other sports[17]. A simple interpretation of this data is that it is more appropriate to define competition according to weight categories; however, this view needs to be considered in the presence of other evidence, to be discussed next.

### *Motor development*

A meta-analysis study examined motor performance through childhood and adolescence[28.] Of the 20 tasks evaluating motor performance in this study, 12 tasks were significantly different when examined according to age and gender. In the context of the age vs mass debate we are not so concerned with gender differences; however the findings of this study have some important implications. For example, the physical differences between males and females after puberty (i.e. increased size and strength of boys), results in males being dominant in certain motor skills. However, despite females being more physically and psychologically developed than males prior to puberty, this is not translated into better performances in the motor skills tests – this may be attributed to the way in which males and females are socialised. With regards to age differences in motor development, the authors suggest that six tasks (i.e. the dash, long jump, sit-ups, grip strength, shuttle run and vertical jump) reflect biological development related to post-puberty changes[28].

Similarly, another study showed there was an increase in all motor abilities from late childhood into late adolescence[16]. This increase in physical ability is due, in part, to the development of fine-motor skills (making their movement more refined) and large muscle activities which they improve as their muscles become bigger and stronger[25]. This allows them to run faster, jump higher, and throw further. This is also true for eye-hand coordination and reaction time, which improves with age. Although it was not discussed in these studies, it is reasonable to assume that there will be meaningful variation around the average score for each of these variable as there was with body size. It may also be assumed that a male, who is heavy for his age, may not necessarily have superior motor skills for his specific age group.

A study of U13, U16, U18 and U19 rugby players profiled the physical and motor components of these players[30]. The main findings were: at the U13 level the forwards had more anthropometric differences (i.e. body mass, height, various skin folds, body-fat percentage, arm girth, calf girth) than the backline players. Furthermore, the halves possessed the greatest rugby-specific skills (i.e. ground skills, sidesteps, passing distance and accuracy, catching while running and kicking distance) and the backline players performed best in the physical and motor components compared to other positions. At the U16 level there were few differences in terms of anthropometric components but within the rugby-specific skills there were many differences between the backline and forwards. At the U18 level there were more differences in the anthropometric components in the forwards than in the backline. There were few differences in playing positions and physical and motor components. At the U19 level the forwards had more anthropometric differences than the backline players, and there were few differences in the rugby-specific skills between positions. In summary, this study suggests that the rate of development of body size and rugby-specific skills with increasing age are dissociated and this should be considered in the mass vs age category debate. The next section will consider the cognitive development of pre-pubescent children and the implications thereof.

### *Cognitive development*

There are four stages of cognitive development which occur as the child gets older[25]. All children go through these stages in the same order. The order cannot be bypassed as each stage is dependent on previous knowledge. The first stage is the sensorimotor stage, which occurs from birth to the age of two years. During this stage, infants combine the use of their senses and motor skills in getting to know their environment. The second stage is the preoperational stage which occurs from the age of two until the age of seven years. During this stage children have an increase in the use of images and words to represent their world. The third stage is the concrete-operational stage which occurs between the ages of seven and eleven years. This is where the child acquires cognitive operations which allows him/her to think more logically about how they experience the world and the things going on around them. The formal-operational stage is where the child acquires the skills to be able to think hypothetically and creatively.

A cross sectional study, which examined age-related differences in a range of cognitive abilities, showed a steep increase in development over childhood, a slower rate over teenage years, continuing into adulthood, followed by a decline into old age[23.] A study on the development of the brain showed that there were age-related increases in white matter density in fibre tracts constituting putative corticospinal and frontotemporal pathways – differences were evident between children and adolescents suggesting gradual maturation of fibre pathways during late childhood and adolescence, presumably supporting motor and speech functions[20]. Indeed, a study using MRI showed that the brain is still developing in the third decade of life[10]. In summary these studies are important because they show that cognitive ability improves with age and that brains continue to grow and develop through adolescence and into adulthood. Therefore, returning to the debate of age group vs weight group, it is clear that development factors other than just body size need to be considered in providing a fair competitive environment. Competition between players with mismatched size may be just as unfair as competition between players with mismatched cognitive development.

Other psychological 'spill-over' from the motor and cognitive development are discussed below.
A study found that boys and girls had delayed growth in height, rather than in weight or skeletal age when their socioeconomic status was considered[6]. These growth delays may be attributed to under-nutrition as this is a factor which is linked to the socioeconomic status of the child. The authors also suggested that there was an association between physical and cognitive growth status. Therefore there is a good likelihood that a physically stunted child will also be psychologically stunted. Perceptions among peers is another important factor, with the age of puberty influencing how adolescent males are viewed by their peers. Early maturers are viewed more favourably than later maturers, while late-maturing boys are more attention-seeking and may also be more impulsive[11]. Therefore, the time when a boy reaches puberty may affect his inter-group relations as well as intra-psychological factors

such as self-esteem and self-confidence. This may also have a bearing on his psychological maturity. This is supported by a more recent study which showed that gross motor ability affected perceived athletic competence[21]. This study also showed that perceived athletic competence was an important determinant of self-worth.

In summary, making children with large differences in cognitive development compete against one another may result in similar problems which occur when children with differences in body size are allowed to compete. The next section will consider the relationship between variations in body size and risk of injury.

## *ASSOCIATION BETWEEN INJURIES AND SIZE*

Whilst a mismatch in size may be interpreted as unfair competition, this has also been implicated as a risk factor for injury[26;27]. As a consequence of the potential problems of having various body sizes participating against one another in the same age group, two prominent investigators of rugby injury in South Africa have previously suggested the introduction of weight categories to Rugby Union. Scher[24] based his views as a measure to reduce injury, while Noakes[19] made this recommendation as a means to reduce the disproportionate contribution of size and weight to success in rugby.

However, it would be difficult to directly investigate mismatches in body size as a risk factor injury in rugby. A conclusion that body mass is a risk factor for injury may be confounded by the fact that age has also been implicated as a risk factor for injury[7;9;15] and as shown in Figure 1, body mass increases with age. A study of rugby across all age groups in New Zealand[22] concluded that a larger body mass or body mass index was a greater risk factor of general injury; however these findings were not replicated in American Football school (junior) athletes[12]. Therefore, while a mismatch in weight, particularly in the front row[26;27], has been retrospectively attributed to some serious injuries in rugby, body size per se has not been clearly shown to be a risk factor for injury.

## *MODELS OF YOUTH RUGBY MANAGEMENT IN AUSTRALIA AND NEW ZEALAND*

Australia and New Zealand have approached the problem of youth player development differently to the way the youth are managed in South Africa. This can probably be attributed to the fact that South Africa has over nine times the number of pre-teen players compared to Australia, and nearly four times as many as occur in New Zealand (Table 1).

**Table 1**: ***The number of registered male players (pre teen, teens and adults) in South Africa, Australia and New Zealand. The (%) represent the numbers as a percentage of the total number of registered male players[3].***

| *AGE GROUP* | *SOUTH AFRICA* | *AUSTRALIA* | *NEW ZEALAND* |
|---|---|---|---|
| **Pre teens** | 239 614 *(51%)* | 25 609 *(31%)* | 63 924 *(49%)* |
| **Teens** | 148 779 *(31%)* | 20 002 *(24%)* | 40 257 *(31%)* |
| **Senior** | 84 522 *(18%)* | 37 179 *(45%)* | 27 203 *(21%)* |
| **Total** | ***472 915*** | ***82 790*** | ***131 384*** |

With the South African model, the number of players decreases systematically with only 18% of the total number of male players being senior players. The pattern of decline is similar in New Zealand, although not as marked. The pattern in Australia is different to both the South African and New Zealand pattern as there is a small decrease in the number of players from pre-teens to teens and then the numbers increase substantially from teens to seniors. The talent development model needs to be considered particularly since South Africa has 2.3 times as many adult players as Australia and 3.1 times as many players compared to New Zealand (Table 1). It may be concluded from these data that there is significant attrition of players with increasing age with the South African model whereas the Australian model seems to be designed to manage and develop the talent far more efficiently. The rate of attrition with increasing age in the New Zealand model is similar to the South African model. A cynical interpretation of the South African data suggests that because there are so many players in South Africa (i.e. 9.4 and 3.7 times as many pre-teen players as occur in Australia and New Zealand respectively; Table 1) the talent does not have to be managed as carefully as does the talent in Australia and New Zealand. With smaller numbers of players, both Australia and New Zealand need to be smarter to ensure that their talent development is more accurate and efficient than the model in South Africa which, by virtue of the large numbers of players, can apply the principle of "survival of the fittest". Whilst this model may suffice in a time where there are an abundance of players, the model will fail if the number of junior players decreases substantially in the future. The Australian and New Zealand models will be summarised below.

### *Australian*

Modified versions of rugby played at the senior level have been created as part of a junior player pathway development strategy[1]. There are three categories of age groups, each with different rules and adaptations to the game.

(i) Walla rugby (7-8 years) - the game is played on a smaller field, with seven players per team and there is no tackling. The rules are designed to develop the game principles of possession, "go forward" and pressure. The individual skills of passing and receiving, running and evasion, scrumming and line-outs are developed.

(ii) Mini rugby (9-10 years) - the principles of Walla rugby are maintained, but the players are all introduced to the contact aspects of the game. The game is also played on a smaller field with 10 players in each team.

(iii) Midi rugby (11-12 years) - this is the transition into the full game. There are 12 or 15 players on a standard-size field.

From the age of 13 years the players are introduced to the game played under full laws.

The Australian Rugby Union maintains that the junior player pathway provides children with a safe and enjoyable introduction to the skills and practical principles of the game of rugby[1]. The gradual exposure to the skills is appropriate for their age. Physical development, size and body shape is not as important in this form of the game.

### *New Zealand*

The New Zealand Rugby Union has developed Small Blacks Rugby, which is designed to help players develop their skills as their physical ability develops[4]. The intention is to make the game safe regardless of the player's age, shape or size. At the under-7 level there are 7 players per team and they play on a smaller field with no tackling allowed. At this level they also play Rippa Rugby, which is a safe, non-contact game for boys and girls. This game is designed to improve ball handling and running skills[4]. From 8 to 10 years there are only 10 players per team and this game is also played on a smaller field. They are introduced to tackling, but players are not allowed to fend off a tackle. There is also a rule that if there is total dominance of one team (i.e. 35 points or more at half-time), the coaches consult on a strategy which will even the competition in the second half. From the age of 10 to 13 years they play with 15 players per team on a full-size field and have modified rules (i.e. limited pushing in the scrum, no lifting in the line-outs). This development programme is designed to provide the players with skills so that when they play the full game they are suitably trained[4].

There have been reports of representative junior teams with weight class restrictions. For example the Auckland Rugby Union have guidelines that boys in the under-12 restricted grade must weigh no more than 49 kg and in the open grade weigh no more than 74 kg[18]. The heavier boys need to move up to the next grade. Unfortunately, there have been reports that this model has encouraged some boys to go on "crash diets" in order to lose weight so that they can play for the team[18].

## *SUMMARY AND RECOMMENDATIONS*

Ideally, the introduction of weight categories at schoolboy level would allow smaller players the opportunity to excel in the game. This would increase the number of players at schoolboy level, and would, in all likelihood, decrease the attrition which occurs in the present model in South African rugby. This alteration may result in a greater pool of players at a senior level. Weight categories would remove the unfair advantage larger players have over smaller players because of their inherited anthropometric characteristics.

However, there are disadvantages of having weight categories for rugby. Firstly, making young, but heavier boys play with older boys may introduce a new set of problems related to social development and injuries. Also it is unrealistic to think that categorizing only by weight, without taking any other body composition factors into account, may overcome problems. For example, a 50 kg boy with 10% body fat compared to the same size body with 20% body fat is going to be at an advantage because he will have more muscle and therefore be stronger and more powerful than the boy with greater body fat percentage. Secondly, children matched for body mass may not necessarily be matched for psychological, cognitive and skill levels. Therefore, while the competitive advantage may be removed from differences in body sizes, new competitive advantages may be imposed by different levels of these other factors (psychological, cognitive and skill) that are also important in sport. Thirdly, a problem which always accompanies weight categories in sport is that of "making weight" – i.e. crash dieting, saunas and the use of diuretics to meet certain weight requirements. Fourthly, and a more logistical problem against weight categories, is that many schools will not have enough players to make a team if they have to subdivide teams into weight categories.

The best solution to the problem, is to adopt a long-term talent development model[29], similar to those practised by Australia and New Zealand. These models are dynamic and consider the maturity status and level of development of the young players, with the overall result of being more inclusive for all sizes rather than exclusive for smaller players. This approach will require a major paradigm shift in South Africa, and may take some time to implement. A more pragmatic approach for a short-term solution can be developed by examining guidelines of maximum weights, specific for age groups and playing positions. The guidelines can be drawn from normative data of different age groups and playing positions[2]. For example, in Table 2 the range of weight encompassing approximately 70% of the players in the various age groups for different playing positions are shown. Therefore, a small proportion of players (about 15%) will be above the upper range shown in the table. Whilst it will be difficult to legislate, it can be recommended that changes are made to the team selection, in the "spirit of the game", if a team has several players in the upper 15% when competing against a team with smaller players. Importantly for injury risk reduction, significant body mass mismatches in key playing positions could be avoided using these guidelines.

***Table 2. The range of body masses (kg) representing approximately 70% of the players in the positions of prop and hooker for under 12, 16 and 18 years[2].***

| | *Body mass (kg)* | | |
|---|---|---|---|
| | **U12** | **U16** | **U18** |
| **Prop** | *59 - 76* | *80 - 108* | *93 – 111* |
| **Hooker** | *53 - 70* | *73 - 85* | *88 - 110* |
| **Lock** | *55 - 67* | *78 - 96* | *87 - 103* |
| **Loose forwards** | *52 - 64* | *74 - 88* | *80 - 95* |
| **Fly/scrum half, centre** | *41 - 59* | *57 - 78* | *68 - 88* |
| **Fullback** | *46 - 63* | *64 - 78* | *68 - 87* |

Besides the risk of injury, failure to address the problem of significant body size mismatches in youth rugby in South Africa may result in the maintenance of a player attrition rate that is much larger than that which exists in other major rugby-playing nations. Whilst South Africa has a large pool of players to draw from, and therefore is less affected by the attrition of players, there is no guarantee that this situation will remain the same in the future. If the pool of players decreases, players will need to become a more valued resource and will have to be managed more carefully. In this case, the implementation of a long-term player development model will be crucial. However, it is hoped that is will not take a severe reduction in the rugby-playing population in South Africa to implement such a successful program.

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