COACHES PERSPECTIVE ON THE POSITIONAL DEMANDS OF SCHOOL BOY (U18/U19) RUGBY PLAYERS DURING A 70-MINUTE MATCH

BY

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ABSTRACT:

INTRODUCTION: Rugby union has been one of the team sports that has grown over the last few years, and the margin between success and failure for teams has become narrower as the years have gone by. The game consists of players going through different movements such as sprints and/or collisions, that vary in intensity. The demands that face schoolboy rugby players are not well understood, and the lack of research in this area leads to a potential lack of understanding of the perceptions that coaches have about the demands that schoolboys are faced with during a match. **OBJECTIVE:** Therefore, the purpose of this study was to determine the perceptions that the schoolboy rugby coaches had surrounding the demands that their players are faced with during a 70-minute match. There were a few secondary purposes of the study, such as determining which school, government or private, had a better understanding or perception of the demands, as well as comparing strength and conditioning coaches' perceptions to regular coaches' perceptions. **METHODS:** This was a cross-sectional, descriptive study to determine the coach's perceptions. These perceptions were collected through an online questionnaire, which consisted of ten sections and 74 questions. The questionnaire was piloted on a subject group with different types of experience. Coaches from the top 100 schools list were contacted through their school website. **RESULTS:** The questionnaire had a 72% response rate: 41 responses from 51 emails. The 41 responses consisted of 23 government schools and 18 private schools, which included 11 of the top 20 rugby schools in South Africa, with most responses coming from the Eastern Cape (41.5%). Results indicated that a government school's coaches had significantly ($p<0.05$) more experience than private schools' coaches, and that they had significantly ($p<0.05$) better academic qualifications than private schools. However, strength and conditioning coaches had significantly ($p<0.01$) better academic qualifications than coach, whereas coaches had significantly ($p<0.01$) better coaching qualifications than strength and conditioning coaches. **CONCLUSION:** "Experience has been shown to be a potential reason for what is described as a good coach". This is also another potential reason why government schools are a dominant force in schoolboy rugby in South Africa. However, this is also coupled with better qualifications showing the dual importance of both experience and education. This study has shown that coaches, within a South African cohort, overall had good general perception of the demands of school level rugby matches.

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CHAPTER I

INTRODUCTION:

Background to the Study

Rugby union has become one of the fastest developing intermittent team sports in the world, with a large increase in the number of players over the past few years (WorldRugby, 2017). As the game has evolved, the margin for error between success and failure has become smaller. Successful performances for a rugby coach means winning and ensuring that all the players have played well. Success for the medical staff means that all players are trained, last the game and remain injury free (Maile, 2002; Shokman et al., 2002). One of the ways coaches and medical staff ensure these successes is through staying up to date with the latest developments in the game, including the changing physical demands of the game, as the preparedness of the players can influence the success and failure of the team. If the players are prepared, they will be able to withstand the demands and ensure that there is a reduced risk of injury (Robinson, Pote, and Christie 2019). One of the biggest predictors for success is that the athlete does not get injured, as the best predictor for a reoccurring injury is a previous injury (De Visser et al., 2012; Hägglund et al., 2013; Orchard, 2002; Swenson et al., 2009). The fewer injuries a team has throughout a competition, the better they perform; this was shown to be the case within elite rugby union (Williams, 2015). This is because player durability is regarded as one of the major factors of success, alongside skills, fitness and tactics (Orchard, 2009). Thus, if a coach cannot select his best team, it may affect team performance (Hägglund et al., 2013).

The game of rugby is played at many different intensities. For example, in a single match a player can experience many periods of high-intensity running bouts followed by collisions, which are then followed by low-intensity bouts (Bradley et al., 2015; Hartwig 2009; Hartwig et al., 2008). These bouts of different activities can have different durations and frequencies depending on the player's position (Bradley et al., 2015; Hartwig 2009; Hartwig et al., 2008; Roberts et al., 2008). Rugby is a unique sport with unique physical and physiological demands placed on the body (Bradley et al., 2015; Hartwig 2009; Hartwig et al., 2008; Roberts et al., 2008). These demands tend to be different for different positions, with the starkest contrast being between forwards and backline players. The contrast comes in the form of distances

covered during a game, time spent during different bouts of activities, as well as the number of high-intensity efforts (Read et al., 2017; Read et al., 2018; Macleod, 2016; Coughlan et al., 2011; Hartwig & Searl, 2009; Austin et al., 2011; Deutsch et al., 2007; Deutsch et al., 2001; Deutsch et al., 1998). This difference in the workload placed on forwards compared to backline players (Bradley et al., 2015a; Bradley et al., 2015b; Phibbs et al.,2017) is, in part, due to the number of impacts a player experiences. Forwards experience more impacts than backline players, as forwards are required to be involved in more tackles, set pieces and collisions than backline players (Macleod, 2016; Owen et al., 2015; Suarez-Arrones et al., 2014; Cunniffe et al., 2009).

While we understand the professional game fairly well (Deutsch et al., 2007; Duthie et al., 2005; Cahill et al., 2013; Coughlan et al., 2011; Cunniffe et al., 2009; Macleod, 2016; Austin, Gabbett & Jenkins, 2011; Reid et al. 2013; Owen et al. 2015; Suarez-Arrones et al. 2014; McLellan et al., 2013), there is limited research on the positional and physical demands placed on adolescent rugby players (Barnard et al., 2020; Read et al., 2017; Read et al., 2018; Hartwig & Searl, 2009; Roberts et al. 2008; Deustch et al., 1998). The current understanding of the demands placed on adolescent players has come from research on the adult format of the game that is then directly applied to the adolescent game (Read et al., 2017; Read et al., 2018). This comparison may not be appropriate, and, therefore, understanding the demands placed on adolescent players is important. For example, the sizes of adult and adolescent players are different (Read et al., 2017; Lombard et al., 2015; Mclellan et al., 2013; Arkell & Lambert, 2011), as is the length of their games (Read et al., 2017; Macleod, 2016; Lombard et al., 2015; Vaz et al., 2016; Mclellan et al., 2013; Arkell & Lambert, 2011). The demands also differ between forwards and backs, mostly due to their differing positional roles, as well as their differences in anthropometry and morphology (Read et al., 2018; Read et al., 2017; Macleod, 2016; Vaz et al., 2016; Mclellan et al., 2013).

The understanding of the relationship between adults and adolescent rugby injuries is not well established (Read, 2017). The nature and type of injuries are similar in the two groups, but the severity differs between groups (Starling et al., 2019; Fuller et al., 2016). Similarly, as the number of players, both professional and schoolboy (U18/U19), have increased, there has been a linear increase in the number of injuries (Quarrie et al., 2017; WorldRugby, 2018; Bleakly et al., 2011). These injuries are not only severe injuries, such as broken bones or concussions, but

also include muscular injuries, which have become more prevalent (Starling et al., 2019; Fuller et al., 2016).

This gap in literature and uncertainty of the demands of schoolboy rugby has, therefore, created a specific need for scientific knowledge around the demands placed on these players (James, Mellalieu & Jones, 2005). The understanding that can be gained from such research can provide scientific knowledge that is required by coaches, trainers and medical staff (Maile, 2002; Shokman et al., 2002).

The perceptions of coaches, with regards to demands that the players are faced in a 70-minute match, has, to the author's knowledge, not been studied. Previous studies that focused on perceptions of coaches found that the coaches' perceptions are changing from a win at all costs mentality to that of improving players growth both on and off the field (Bennie & O'Connor, 2010). Recent studies have focused on coaches' perceptions relating to talent identification and player election (Chiwaridzo et al., 2019a; Chiwaridzo et al., 2019b). The perceptions within these studies highlighted that player fitness and ball skills play a vital role in their selection (Chiwaridzo et al., 2019a; Chiwaridzo et al., 2019b). As player fitness is a key aspect in selection, the perceptions of coaches of the demands of the game are important: if players are not adequately prepared for the demands of the game, injuries may occur (Robinson et al., 2019).

A study conducted on South African school-level coaches found that players were being generically trained rather than positionally (Robinson et al. 2019). It was identified that there was a lack of rugby conditioning structures and knowledge. This came down to different schools, such as government and private schools, having to face difficulties with regard to educators, resources and facilities (Klein et al., 2016)

Therefore, the perceptions and understanding that coaches and strength and conditioning coaches have of the demands of the game within a South African school environment could present interesting findings. Previous research had reported that the qualifications of strength and conditioning coaches involved in South African school-level rugby did not represent any rugby demands within the course material (Robinson et al., 2019; NSCA, 2018).

This is interesting, considering the unique demands of the game at this level – thus adequate training and preparation need to be aligned with an understanding of the demands of the game.

Statement of the Problem

There is limited information on the positional demands of schoolboy (U18/U19) rugby in South Africa. Furthermore, the coach's perceptions of these demands are also lacking. The knowledge around whether or not the coaches know the distances, common injuries or even what positions experience what specific demands is not known. The purpose of this study was to describe the understanding that South African coaches have of the demands placed on players during a schoolboy (U18/U19) rugby match. The coaches consist of regular coaches and strength and conditioning coaches from private and government schools.

Objectives

The objectives were three-fold:

1. Determine the knowledge that all coaches had of school boy rugby match demands.
2. Compare the coaches' knowledge and experience of the demands against the strength and conditioning coaches' knowledge of the demands.
3. Determine if there was a difference in knowledge and experience between private and government schools' coaches'.

Research Hypothesis

The knowledge and perceptions that the coaches have of the demands of a schoolboy (U18/U19) rugby (70-minute) match is expected to be similar to literature. It is also expected that perceptions will be different between coaches and strength and conditioning coaches, and that there will be a better perception of the demands at the private schools compared to the public schools. The experience and qualifications is expected to be different for both coaches and strength and conditioning coaches as well as between government and private schools.

STATISTICAL HYPOTHESES

1. Ho = Private school coaches and government schools have the same amount of coaching experience

   Ha= Private school coaches and government schools do not have the same amount of coaching experience

Ho = μpce = μgce

Ha = μpce ≠ μgce

2 Ho = Strength and conditioning coaches and coaches have the same amount of experience.

Ha = Strength and conditioning coaches and coaches do not have the same amount of experience.

Ho = μce = μsce

Ha = μce ≠ μsce

3 Ho = Coaches and Strength and conditioning coaches have the same standard of coaching qualifications

Ha = Coaches and Strength and conditioning coaches have the same standard of coaching qualifications.

Ho = $\mu cq_1 = \mu scq_1$

Ha = $\mu cq_1 \neq \mu scq_1$

4 Ho = Coaches and Strength and conditioning coaches have the same standard of academic qualifications

Ha = Coaches and Strength and conditioning coaches have the same standard of academic qualifications.

Ho = $\mu cq_2 = \mu scq_2$

Ha = $\mu cq_2 \neq \mu scq_2$

Hypothesis Key

Ho = Null Hypothesis

Ha = Alternative Hypothesis

PCE = Private school coaches' experience

GCE = Government school coaches' experience

CE = Coaches' experience

SCE = Strength and conditioning coaches' experience

CQ1 = Coaches' coaching qualifications

SCQ1 = Strength and conditioning coaches' coaching qualifications

CQ2 = Coaches' academic qualifications

SCQ2 = Strength and conditioning coaches' academic qualifications

IMPORTANT NOTE:

This study was intended to investigate the movement demands of adolescent school boy rugby players using Global Positioning System (GPS) technology. However, the data collection part of the study was due to take place as the global COVID-19 pandemic resulted in lockdown in South Africa in March 2020. The study was therefore adapted to look at the perceptions of the demands from the perspectives of different coaches within South Africa.

CHAPTER II

REVIEW OF RELEVANT LITERATURE:

It is believed that Rugby football (henceforth referred to as rugby) was invented in 1823 by a young boy called William Webb Ellis, who picked up the oval-shaped ball and ran with it towards his opponent's goals (Bolligelo, 2006; Gustafsson, 2013). The very first international rugby match was played between England and Scotland in 1871 and, soon after this, the game of rugby travelled to numerous countries around the world. The game arrived in South Africa in the 1880s via the British settlers, who arrived in the Cape area; the sport was played in elite schools as well as predominantly British clubs (Gustafsson, 2013). Rugby was considered a sport for those referred to as more ‘civilized' and ‘affluent', compared to soccer, which was considered for those deemed ‘uncivilized' and ‘poor' (Gustafsson 2013). In 1995, the game of rugby became professional, and the International Rugby Board (IRB) at the time removed all restrictions on the payment of players (Fizel & Fort, 2004). Since this era, the game has become more professional, has grown globally and become popular. The IRB, who changed to World Rugby in 2014, reported in that year that 3.5 million men were playing the game within 117 unions (WorldRugby, 2017). In July 2019 there were 2.7 million women playing rugby, which was an increase of 10% from the previous year. This 10% increase was surpassed by the increase in formally registered female players, a number that saw a 28% increase (EnglandRugby, 2020). Part of the growth of the game has come about from the advancement in technology such as television and social media (WorldRugby, 2018). Television viewership has increased since the professional era (WorldRugby, 2018). During the Rugby World Cup of 2015, there was a viewership of over 120 million people (WorldRugby, 2018).

Currently, there are 121 countries that have registered male rugby players, with a total of 8 500 000 registered male players and 580 000 registered female players in the world (WorldRugby, 2018). The game is one of the fastest developing team sports in the world with a 17% (22%–39%) increase in the number of players during 2016 (Quarrie et al., 2017; WorldRugby, 2018; Bleakly, Tully, & Connor, 2011). The country with the most players is England (two million), which is four times as many as South Africa, which has approximately 500 000 players (WorldRugby, 2018). The 500 000 players in South Africa include all ages, schools, clubs and elite players. It must be noted that an exact figure of the number of schoolboy rugby players in

South Africa is not freely accessible — however, it is known anecdotally that schoolboy rugby may have greater viewership than even the elite game.

Rugby Union

Rugby is played by 15 players on the field, with eight reserves. Reserves are allowed to be used as substitutes if the coach wants to make a tactical change or for an injury, and this substitution can occur when there is a stoppage in the game. Rugby is a contact sport with high physicality and collisions, as well as a large number of high-intensity bouts executed repeatedly (Bradley et al. 2015; Hartwig et al., 2009; Hartwig, Naughton, and Searl 2008). These bouts can consist of sprinting, walking, jogging and tackling.

The field dimensions are 100m in length, with the width varying between 60m and 70m (WorldRugby, 2020a). The regulations state that the width has to be between 50m and 70m. World Rugby states that for a game of rugby there has to be two teams of 15 playing against each other (WorldRugby, 2020a). Both teams have to play fairly and abide by the laws as well as have good sporting conduct as determined by World Rugby. The game has many different actions, including kicking, passing, running and grounding the ball over the try line. The main object of the game is to score a try, which occurs when one team grounds, in a controlled manner, the ball over the opposition's try line (worth five points) (WorldRugby, 2020a). Scoring a try is the way a team can score the most points (WorldRugby, 2020a). The other means of obtaining points are conversions (occur after a try has been scored, worth two points), penalty kicks at goal, or even dropkicks (worth three points each), which is kicking the ball on the half volley through the goalposts (WorldRugby, 2020a). The team that scores the most points ends up as the winner of the rugby match (WorldRugby, 2020a).

Player Positions and Player Characteristics

Each player on the field has a specific position and number, which are outlined by World Rugby (WorldRugby, 2019). The 15 players on the field are divided into two categories: forwards (eight) and backline players (seven) (Macleod, 2016; WorldRugby, 2019). The forwards numbers range from one to eight, and the backline players range from nine to fifteen (Macleod, 2016). The forwards consist of a front row, which has two props (numbers one and three) and one hooker (number two), who is in the middle between the two props in the scrum, and who is responsible for throwing the ball into the lineout (Macleod, 2016). There are two locks

(numbers four and five) in the forwards who are normally the two main jumpers in the lineout. Then there are three loose forwards, consisting of an openside flank (number six), blindside flank (number seven) and an eighth man (number eight) (Macleod, 2016). The backline has a half-back pairing, which is the scrumhalf (number nine) and the flyhalf (number 10). Then there is a left-wing (number 11), a right-wing (number 14) and a fullback (number 15), which make up the back three. Finally, there is a centre pairing, which is made up of an inside centre (number 12) and an outside centre (number 13) (Macleod, 2016; WorldRugby, 2019). The two wings and fullback make up the outside backs, while the inside backs are the two centres (Macleod, 2016; WorldRugby, 2019).

The main role for forwards is to compete for possession of the ball at either a ruck, maul or a set-piece. The main role for backs is to gain field position, territory, and score points. The halfbacks have a very important and specific role, which is the tactical decision making for the team. For example, they decide when to kick and where to kick, or to when run and what moves to run using the ball. "Moves" is a term that is used to describe a deliberate sequence of events that is used to fool the opposition by the backs (Macleod, 2016; WorldRugby, 2019).

Forwards and backline players have different anthropometric characteristics due to the roles and movement characteristics that are required by their specific positions (Macleod, 2016; Duthie et al., 2006a; Duthie et al., 2006c). As they are involved in more contact situations, forwards are, on average, taller (6cm) and heavier (22.3kg) than backline players at the Super rugby level (Mclellan et al., 2013). Forwards have a higher lean body mass and a higher sum of seven skinfolds than the backline players (Macleod, 2016; Mclellan et al., 2013). Therefore, forwards have more muscle mass as well as more adipose tissue than that of backline players.

There are also intra-forward differences, such as the front row being heavier than the back row (21kg on average) although they are of similar height (Mclellan et al., 2013). This is in contrast with the differences between inside backs and outside backs, where the inside backs are lighter and shorter than the outside backs (on average 13kg and 3cm, respectively) (Mclellan et al., 2013; Duthie et al., 2006a; Duthie et al., 2006c). There is a difference between adolescents and adults in anthropometry, with adults being bigger, stronger and faster than adolescents (Read et al. 2017; Vaz et al., 2016; Mclellan et al., 2013).
In adolescents, there is minimal anthropometric difference between forwards and backs (Vaz et al., 2016; Read et al. 2017), although comparing adolescents to adult players shows that the

latter are heavier and taller (Vaz et al., 2016; Read et al., 2017). Research also shows that there are also differences between elite U18 and U21 players (Vaz et al., 2016; Read et al., 2017). On average, the u21 players are 3cm taller and 10kg heavier (Vaz et al., 2016; Read et al., 2017).

Analyses on the evolution and development of South African u20 players showed that there was a change in height, weight, strength, muscular endurance and speed over a period of 13 years (1998-2010) (Lombard et al., 2015). The largest positive change over the period was that of strength and muscular endurance, with there being no improvement in aerobic performance (Lombard et al., 2015). The evolution of the players is due to the change and improvement in training methods, as well as there being a desire for players to be bigger and stronger to be able to dominate the contact situation (Cunningham et al., 2016). Therefore, the results of the study can be used as scientific evidence to show that player changes over the 13 year period can be linked to the increase of professionalism of the game of rugby (Lombard et al., 2015; Arkell & Lambert 2013).

The success and future career potential of rugby players can be influenced by their physical size and strength. The model of physical size and strength does not fit into any talent identification models of the South African youth system. However, anecdotally it has been found that the bigger, stronger and faster a player is, the better their chance of selection into South African youth teams, regardless of skill level. The one potential method of improving your physical condition is by the implementation of proper strength and conditioning programs. There is little literature on what coaches or strength and conditioning coaches in rugby perceive to be important regarding player characteristics for different positions (Robinson et al., 2019). Furthermore, how these characteristics may impact a players performance in that particular position is something that needs to be explored further (Robinson et al., 2019).

Demands of Rugby

As rugby is an intermittent sport, there are various bouts of different intensities, varying from movement demands to collisions (Gamble, 2004). The movements and the demands of the game can vary from high force-low velocities, such as scrummaging, to high velocity-low force, such as sprinting, or high force-high velocity, such as tackling (Dodge, 2016).

These demands of the game were first investigated by the use of time-motion analyses (Deutsch et al., 2007; Duthie et al., 2005; Duthie et al., 2003). This form of analyses uses video footage to monitor and time the movement patterns of the players. The movements are then quantified by movement type and duration (Dobson & Keogh, 2007). More recent research has used global positioning systems, hereon referred to as GPS. The information obtained from these can include physical as well as physiological loads (Cahill et al., 2013; Coughlan et al., 2011; Cunniffe et al., 2009; Duthie et al., 2003). Time-motion is more time consuming than that of the GPS, as well as less reliable and more subjective (Austin, Gabbett, & Jenkins, 2011; Deutsch et al., 2007).

In the modern era of sport, performance analysis has become one of the most beneficial methods for coaches to provide feedback to players. The English Institute of Sport states that there is an unreferenced statistic that shows that athletes and coaches only recall about 30% of a game or performance, leaving the remaining 70% of the game unrecalled. This supports the need for match analysis, as it allows coaches and players to get a full understanding of the demands (Macleod, 2016). A match-analyses approach can help coaches make better selections, as well as help strength and conditioning coaches develop better programmes for the players to ensure longevity and minimize injuries (Quarrie & Hopkins, 2007; Bracewell, 2002; Hughes & Franks, 1997). Technology, such as GPS units, can also be used by practitioners to evaluate match loads, training loads and programmes to ensure that the players are training at an optimal level (Macleod, 2016).

Forwards experience 14% of the game at a high intensity, and backline players, 6% (Duthie et al., 2005). Studies have consistently shown that there is a difference between the two positional groups in terms of the duration of work and rest periods (Duthie et al., 2005; Deutsch et al., 2007). The forwards have a higher work-to-rest ratio than that of backline players (Austin et al., 2011; Deutsch et al., 2007). Loose forwards have the longest maximal work duration compared to the outside backs, who have the least, while the prop forwards have, on average, the least amount of rest time (Deutsch et al., 2007). The outside backs have the longest rest period compared to any other subgroup (Deutsch et al., 2007). The potential reason for this is that prop forwards have the longest period of jogging as well as time spent in contact situations, while the outside backs have both the least amount of time jogging and time spent in contact situations (Roberts et al., 2008; Deutsch et al., 2007). At an adolescent level, during practice time, forwards have a lot more stationary time as well as time spent jogging compared to

backline players (Hartwig et al., 2009; Duthie et al., 2006b). The time spent doing all activities is longer during a match than a practice (Hartwig, 2009). During a match, the backline spends more time walking and sprinting than forwards do (Hartwig et al., 2009; Duthie et al., 2006b).

In a sample of over 700 participants (between 2004 and 2010) it was reported that forwards are involved in more contact situations than backline players are, and that international level players cover more distance than those playing a lower level of rugby (Quarrie et al., 2013). Forwards experienced 838 contacts compared to 573 experienced by backline players (Coughlan et al., 2011). Additionally, forwards have more "severe impacts", identified as an impact above a certain g-force, than the backline players; 174m.s^2 vs 30m.s^2 (Coughlan et al., 2011). When the two positional groups are subdivided into front row, locks and loose forwards, there is a difference between the groups. During a match, the front row has the highest number of impacts (499), while the second row the least (410) (Macleod, 2016; Owen et al. 2015; Cunniffe et al., 2009). From the backs, the scrumhalves have a higher impact than the locks (Owen et al., 2015). More recent research has supported the fact that forwards experience more impacts than the backline players (Owen et al. 2015; Suarez-Arrones et al., 2014; Cunniffe et al., 2009).

In terms of distance covered, elite-level backline players cover between 6100m and 7000m, and the forwards between 5500m and 6250m (Macleod, 2016; Coughlan et al., 2011; Roberts et al., 2008). On average, the elite players cover 6950m, compared to the u19 players who cover 4940m (Cunniffe et al., 2009; Read et al., 2017; Hartwig, et al., 2009; Deutsch et al., 1998; Macleod, 2016; Coughlan et al., 2011; Roberts et al., 2008). When comparing u19 players to elite players, the latter cover more distance (Cunniffe et al., 2009; Macleod, 2016; Coughlan et al., 2011; Roberts et al., 2008). One study highlighted that u19 players averaged 4470m during a game, with more than two-thirds of the time spent either walking or running (Venter et al., 2011). It must be noted that, in South Africa, u19 players can still be considered adolescent players, as many are still representing their school's first team at this age.

In u19 rugby players, backline players cover more distances at lower heart rates than that of forwards (Read et al., 2017; Hartwig et al., 2009; Deutsch et al., 1998). The distance covered by the tight five, who are the front row and locks, was the least, while the loose forwards covered the most distance out of the forwards (Read et al., 2017; Hartwig et al., 2009; Deutsch et al., 1998). The outside backs covered the most distance in the whole team and in the backline

(Read et al., 2017; Hartwig et al., 2009; Deutsch et al., 1998). In contrast, Cahill et al., (2013) found that the scrumhalf covered the most distance, 7098 (±778) m, which was data obtained from 98 English premiership players. According to Deutsch et al., (1998), props and locks cover 4400 (±398) m, the loose forwards 4080 (±363) m, the inside backs 5530 (±337) m and the outside backs 5750 (±405)m (Deutsch et al., 1998). At the U18 level, forwards cover less distance (4015 m) than that of backline players (4315 m) (Read et al., 2017; Hartwig et al., 2009). The highest total distance covered for the forwards was 4232 m, compared to the highest for the backs, which was 4489m (Read et al., 2017; Hartwig et al., 2009). The backs also cover more distance during practices than the forwards (Read et al., 2017; Hartwig et al., 2009).

In contrast, u16 forwards cover more distance than backline players during matches; 4364 m and 3884 m respectively (Read et al., 2017). This was contrasted by the fact that, on average, u16 players cover 4000 m with no significant difference between backs and forwards (Hartwig et al., 2011). The U19 games are longer than U16 rugby games in South Africa, with both age groups playing games that are shorter than that of the elite games, which is the main reason for the differences in distances covered. However, there are similarities in the types of movements, such as time spent standing, walking and jogging, between adolescents and elite level players. Variances could also potentially occur due to varying ground conditions, the weather, as well as the game plan from the coach, even though the key roles of the players will remain similar throughout (Quarrie and Hopkins, 2007).

Numerous studies have found that different positions cover varying distances through movement types during a game of rugby (Deutsch et al., 2001; Read et al., 2017; Hartwig et al., 2009; Deutsch et al., 1998). Thirty-seven percent of the time, players stand with very little time spent doing high intensity running or sprinting (Cunniffe et al., 2009). Backs also spend more time in high-intensity zones (Reid et al., 2013; McLellan et al., 2013). These high-intensity zones consist of periods where players are doing activities in the highest heart rate zones (Reid et al., 2013; McLellan et al., 2013). At an adult level, the average forward reaches top speeds of 6.8 $m.s^{-1}$ compared to backs, who reach an average top speed of 7.7$m.s^{-1}$ (Macleod, 2016; Coughlan et al., 2011). Backline players also have a higher average speed of 7.4 $m.s^{-1}$ compared to that of forwards, who have an average speed of 6.8 $m.s^{-1}$ (Macleod, 2016; Coughlan et al., 2011). Distances covered in high-intensity zones are 330 m for forwards and 540 m for backline players (Reid et al., 2013; McLellan et al., 2013). In high-intensity zones, forwards cover less distance through sprinting than the backs, highlighted by backs

covering 50 ± (76) m compared to forwards, who cover 36 (± 64) m (Cahill et al., 2013). A potential reason for this is that backs experience high-intensity efforts through sprinting bouts, while forwards experience high-intensity efforts through static exertions (Reid et al., 2013; McLellan et al., 2013; Roberts et al., 2008). Distances covered in high-intensity zones increase from prop forwards to loose forwards, and from scrumhalves to outside backs (Macleod, 2016).

Players spend 10% of their time cruising and 14% of their time striding, which results in a breakdown of distances: walking for 2800 m, jogging for 1900 m, cruising for 700 m, striding for 990m and finally sprinting for 420 m (Cunniffe et al., 2009). The following definition was provided for the categories mentioned: walking (0-6km.h^{-1}), jogging (6-12 km.h^{-1}), cruising (12-14 km.h^{-1}), striding (14-18 km.h^{-1})and sprinting (>20 km.h^{-1}) (Cunniffe et al., 2009). This break down shows that sprinting occurs mostly during the game when the ball is in play and, jogging normally occurs when players move from one set piece to another set piece (Deutsch et al., 2001; Read et al., 2017; Hartwig et al., 2009; Deutsch et al., 1998). In the second half of the game, all players cover more distance compared to the first half of the game (Coughlan et al., 2011; Cunnifee et al., 2009).

The work to rest ratio data available is only for adult players (Duthie et al., 2005; Deutsch et al., 2007) and, to the author's knowledge, studies on this have not been done on adolescent players. Time motion analysis information is valuable for strength and conditioning coaches, as it may change and improve the specificity of the conditioning programmes (Kraak, Malan, & Van Den Berg 2011; Schoeman, 2016). This information can also assist coaches in obtaining an understanding of what movement patterns occur during a match (Kraak et al., 2011; Schoeman, 2016). Forwards and backs do not cover the same amount of distance at any age level (Cunniffe, et al., 2009; Macleod, 2016; Coughlan et al., 2011; Roberts et al., 2008). Further, from U16 to adult or elite level the distance covered by both positional groups increases (Cunniffe et al., 2009; Macleod, 2016; Coughlan et al., 2011; Roberts et al., 2008). These, therefore, suggest that forwards and backs need to be conditioned differently, and that conditioning needs to be adapted for an adolescent sample. The amount of data that has been collected, to the author's knowledge, regarding adolescent positional demands in South Africa is limited.

Coaches will be exposed to some of this information in their relevant coaching qualifications, but not all of this information is provided, particularly at an adolescent level. So the level of

understanding of the nuances of the demands of the game and how coaches understand this, is not known. As a result this then leads into the concept of workload monitoring, which is important. This is a technique typically used by the strength and conditioning coach to train players with regards to the demands of the game. It could be that these coaches understand the demands better, workload monitor and train players accordingly; however this is yet to be outlined in relevant literature.

Workload Monitoring

Workload monitoring is a method of understanding the load that is placed on a player during training, as well as during competition (Borresen & Lambert, 2009; Gabbett, 2016; Windt & Gabbett, 2017). Strength and conditioning coaches have started using this method to manage fatigue as well as decrease the number of muscular injuries (Borresen & Lambert, 2009; Gabbett, 2016; Windt & Gabbett, 2017). This is done by ensuring that players are training optimally and not under- or over-training, which can lead to injuries over time (Coutts, Reaburn, Piva, & Rowsell, 2007; Gabbett et al., 2014).

Workload monitoring consists of monitoring two different loads: internal and external loads. The internal load is the physiological and psychological stress an athlete feels during training, whilst the external load is the amount of work the athlete has done (Gabbett, 2016; Nell, 2016). The external load can either be sporting or non-sporting loads, such as a rugby practice, which can occur during many different activities on or off the field (Comyns & Flanagan, 2013; Gabbett, 2016; Nell, 2016).

The internal load is the response to the external load, which can be measured through objective and subjective methods, (Figure 1). The subjective data is, therefore, the psychological and physiological data from the athlete's point of view, whereas the objective data is collected via observation or testing of the athlete (Comyns & Flanagan, 2013; Gabbett, 2016; Nell, 2016) (Figure 1). Using both of these loads, (internal and external), can create a holistic understanding of the load placed on a player daily (Bourdon et al., 2017). This allows for the optimization of training and performance during competition (Bourdon et al., 2017).

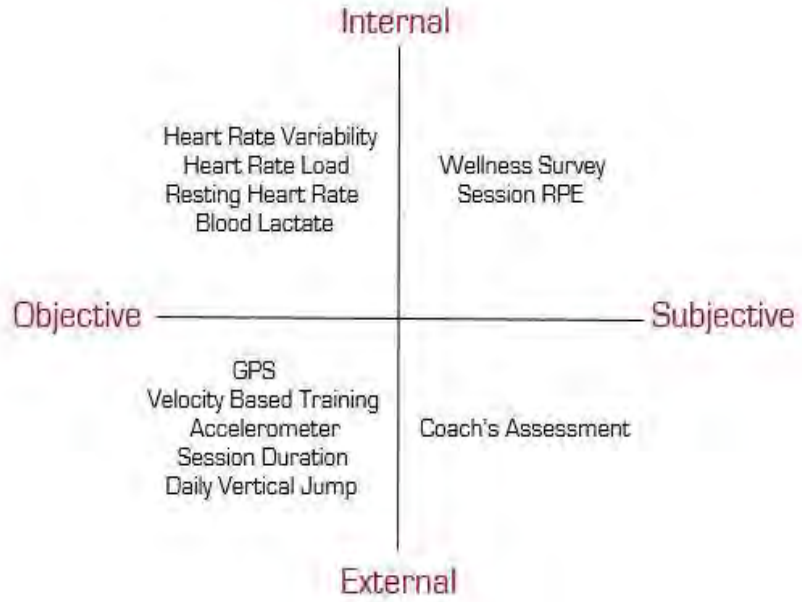

Figure 1: Internal and External load quadrant -Sourced: https://fitforfutbol.com/2016/04/the-athlete-monitoring-startup-kit-2/

This optimization can be done by using the acute:chronic ratio. Acute refers to one training session load or one week's training load (Borresen & Lambert, 2009; Gabbett, 2016). Chronic refers to a longer period of time encompassing, for example, a cumulative load for two weeks of training (Borresen & Lambert, 2009; Gabbett, 2016). This ratio compares the two to determine potential risk of injury (Borresen & Lambert, 2009; Gabbett, 2016). If the athlete's chronic work load is high and acute workload is low they are being prepared well in terms of fitness and reduced risk of injury (Bowen et al., 2017). An optimal acute:chronic ratio is between 0.8 and 1.3 (Borresen & Lambert, 2009; Gabbett, 2016) reflected as arbitrary units. This ratio of 0.8 to 1.3 is referred to as the 'sweet spot' which is where injury risk is at its lowest (Bourdon et al., 2017; Windt & Gabbett, 2017).

There are studies that have looked at workload data of adolescents, elite adolescents and elite players (Table I). These studies have found that there is a difference between forwards and backs. At an elite adolescent level, forwards have a higher workload than backline players (Bradley, Cavanagh, Douglas, Donovan, Twist, et al., 2015a; Bradley, Cavanagh, Douglas, Donovan, Morton, et al., 2015b; Phibbs et al., 2017). Elite adolescents had a contrasting relationship to that of elite adult players, in that backs had a higher workload than that of the forwards (Bradley, Cavanagh, Douglas, Donovan, Twist, et al., 2015a; Bradley, Cavanagh, Douglas, Donovan, Morton, et al., 2015b; Phibbs et al.,2017). It must be noted that there was a similar workload found between non-elite adolescents and elite adolescents.

Table I: Summary of the literature of training loads placed on elite adolescent and adult rugby players.

Authors	Year	Mean WL (AU)	Forwards WL (AU)	Backline WL (AU)
Phibbs *et al*	2018	1210 (± 571)	/	/
Phibbs *et al* [#]	2017	1217 (± 367)	1002 (± 279)	1246 (± 345)
Bradley *et al* *	2015a	/	1776 (± 355)	1523 (±434)
Bradley *et al* *	2015b	/	3398 (± 335)	2944 (±410)

*/ = not mentioned in article * = Elite #= Elite adolescents*

A potential reason for these findings is that the different levels could have experienced a similar amount of collisions and impacts. The more collisions there are in a game, the higher the workload and session rating of perceived exertion rating (Costello et al., 2018). Therefore, forwards being involved in more collisions than the backs supports them having a higher subjective workload than that of the backline players (Macleod, 2016; Owen et al., 2015; Suarez-Arrones et al., 2014; Cunniffe et al., 2009).

There are higher workloads as well as session rating of perceived exertion (sRPE) ratings for those in the collision practices compared to those not in collision practices (Costello et al. 2018). This supports the fact that forwards have a higher workload than the backs purely because backs experience fewer collisions than forwards. This has been supported in elite rugby, where the forwards have a greater overall load than that of the backs (1426 AU vs 376 AU) (Cunniffe et al., 2009).

According to the author's knowledge, workload data of adolescent rugby players in South Africa has only one published paper. The South African cohort had a higher overall workload (Barnard et al., 2020) compared to the Northern Hemisphere cohorts of elite and adolescent players (Phibbs et al., 2018; Phibbs et al., 2017), with an approximate difference of 1500 AU. The Barnard et al., (2020) cohort had similar findings to previous studies, showing that forwards have a higher workload than backs, but their adolescent sample had similar workloads to that of elite athletes (Bradley et al., 2015a&b).

Whether school level rugby coaches understand the concept of workload monitoring and its nuances is also an area that requires further exploration. It would be interesting to determine

how much communication there is between different types of coaches, and to see if the understanding is similar or not.

One of the main reasons we use workload monitoring is as an attempt to reduce the number of injuries in rugby. A school-level coaching team should consider the prevalence, severity and nature of injuries. The extent this is done is unclear.

Injuries

Because of the high physical demands and the high injury incidence in rugby in comparison to most other sports, it has its own definition for injury (Williams et al., 2016; Gamble, 2004). Almost 90% of injuries occur during a match, with approximately 10% of senior elite players incurring an injury during practice (Brooks and Kemp, 2008). The nature of the game, as well as the fatiguing effect that it has, has historically caused more injuries to occur during the second half of the game than the first half (Bathgate et al., 2002; Brooks et al., 2005a).

Fuller et al., (2007b; page 179) state that an injury in rugby can be defined as "any physical complaint, which was caused by a transfer of energy that exceeded the body's ability to maintain its structural and/or functional integrity, that was sustained by a player during a rugby match or rugby training". World Rugby includes in their definition that an injury occurred irrespective if there was medical attention needed, or if it resulted in time-loss from rugby activities (WorldRugby, 2019).

An injury that results in a player receiving medical attention is referred to as a 'medical-attention' injury, and an injury that results in a player being unable to take part fully in future rugby training or match play is referred to as a 'time-loss' injury." (Yeomans et al., 2018; Freitag et al., 2015; Fuller et al., 2007;). Further, there are other injuries, such as recurrent injuries and non-fatal catastrophic injuries (Fuller et al., 2007). Recurrent injuries are those which occur due to a previous injury (WorldRugby, 2019; Fuller et al., 2007). Non-fatal catastrophic injury are those which have resulted in a catastrophic consequence, such as a broken leg, which requires medical attention as well as a lengthy time off sport, but that has not resulted in death (WorldRugby, 2019; Fuller et al., 2007).

World Rugby have, from these definitions, established guidelines for the understanding of injuries and how to deal with them. This has allowed for the development of injury surveillance studies in rugby (Bathgate et al., 2002; Best et al., 2005). These studies have shown that there is a high prevalence of musculoskeletal injuries in rugby (Bathgate et al., 2002; Best et al., 2005), which was indicated by the incidence of new injuries per 1000 playing hours (Yeomans et al., 2018; Fuller et al., 2007b; Nicol et al., 2010). Playing hours can, and do, include training and match hours (Yeomans et al., 2018; Fuller et al., 2007b; Nicol et al., 2010). These injuries can range from a minor injury to a major one, such as a laceration or even to a broken bone. Injury incidence can be calculated as follows:

$$\text{Injury Incidence } \frac{no.of Injuries}{(no.of matches)X(no.of players)X(matchduration)} \text{x } 1000 \text{ (Fuller et al., 2007b)}$$

Davidson (1980) found that the injury incident rate increased with age (Davidson, 1980). Furthermore, as adolescents get older, the time lost from training or playing time increases following injury (Davidson, 1980). It must, however, be noted that the Davidson's (1980) study was done before the year 2000, and the game has changed quite considerably since then (WorldRugby, 2019). Current evidence has shown that there is a large difference in the professional game compared to that of high school games and women's and men's amateur games, with the former having a higher injury incidence rate (Molloy & Wiley, 2008; Palmer-Green et al., 2013; Schick, Roberts et al., 2013). These differences can potentially be explained by the different definitions of injury in different studies; however, injury incidence is always reported the same, and has been shown to increase with competition level and age (Davidson, 1980; Brooks & Kemp, 2008).

Numerous studies have been done on the injury incidence rate of professional rugby, with many looking at the most iconic tournament in the rugby calendar, the Rugby World Cup (Jakoet & Noakes, 1998; Best et al., 2005; Brooks et al., 2005a; Brooks et al., 2005b; Fuller et al., 2007a; Brooks & Kemp, 2008; Fuller et al., 2008a; Kemp et al., 2008; Fuller et al., 2015). The injury incidence rate at Rugby World Cups has increased over the years, with the lowest injury rate being at the 1995 World Cup. The injury rate was 30 injuries per 1000 playing hours during the pool stages, and then increased to 43 injuries per 1000 playing hours in the knockout stages

of the Cup (Jakoet & Noakes, 1998). The injury rate then increased from 1995 to 2003 to a high of 97.9 injuries per 1000 playing hours (Best et al., 2005), with some of the reasons for this increase being mismatches of skill, fitness and resources available for the different countries partaking in the World Cup (Wall, 2011). The 2011 World Cup and 2015 World Cup had lower injury rates per 1000 playing than 2003, with 83.9 and 90.1 respectively (Fuller et al., 2008a; Fuller et al., 2016). At the 2015 World Cup, the backs had a higher injury incidence rate than the forwards; 100.4 vs 81.1 per 1000 playing hours (Fuller et al., 2016).

Nature of the Injuries

The current understanding of adolescent rugby injuries is not well known since there is minimal research done on it, especially in a South African context. Older research, such as the research done by Beer (1991), identified that, within adolescent players, the most common injury sites were to the head, neck and upper limbs (Beer, 1991).

The most common injuries were fractures (27%), ligament/tendon injuries (25%) and muscle injuries (17%) (Beer, 1991). This has been supported more recently in America, where it was reported that the most common injury areas for rugby players were to the face, shoulder, head, ankle and knee (Yard & Comstock, 2006). The most common injuries were the same as what was reported by Beer (1991), which were strain/sprain, lacerations, fractures, contusions and abrasions (Yard & Comstock, 2006). Male rugby players, below the age of eighteen years, had a fracture incidence rate of 25.7%, which was the most common injury (Yard & Comstock, 2006). This was followed by strains/sprains at 23.7% and abrasions or contusions at 19.8% (Yard & Comstock, 2006), which was supported by Nicol et al., (2010) and Freitag et al., (2015). Factures are largely due to impact and are considered ‘impact injuries’ (Yard & Comstock, 2006; Bleakley et al., 2011). Muscle strains have been linked to a lack of conditioning and physical preparedness for the game (Yard & Comstock, 2006; Windt & Gabbett, 2017). To reduce or prevent injuries, one of the suggestions is to ensure that the teams have a conditioning coach (Yard & Comstock, 2006).

During the 2015 Rugby World Cup, the most common injury location during a match was head/face (22%) and the knee (16%), while muscle strain and ligament sprain, both 23,1%, were the most common type of injury to occur (Fuller et al., 2016). The most common reason for an injury was because of being tackled (24,7%) (Fuller et al., 2016).

The tackle event was identified, by Nicol et al., (2010), to be the most likely cause of an injury in high school rugby at a causation percentage of 62.1% of all injuries, with the ruck causing 24.3% of the injuries and the scrum 5.4% of injuries (Nicol et al., 2010). The tackle event can injure either the tacker or the player being tackled. or both (Fuller et al., 2007a; Quarrie and Hopkins, 2008; Fuller et al, 2010; Fuller et al., 2016). The rugby tackle has five times more chance of causing injury than any other contact situation in rugby (Fuller et al., 2007a; Hendricks and Lambert, 2010). According to Brookes et al., (2005a), the most common mechanism of injury in forwards was the ruck and/or maul situation, and, for backline players, it was the tackle. Freitag et al., (2015) found that being the player tackled resulted in more injuries (16.5 – 65%) compared to the act of tackling (18.5 – 40%). Tackle events executed without the lack of proper technique are the main cause for concussions at schoolboy rugby level in South Africa (Clark et al., 1990). This statement has been supported by recent research, which stated that the better the tackle technique, the less likely a tackle related injury (Burger et al., 2016). The tackler, at schoolboy level, has a fourfold higher possibility of getting a concussion than the ball carrier, with the most concussions occurring in the fourth quarter, as is common for tackle injury occurrences (Mc Fie et al., 2016).

The fourth quarter has been identified as a dangerous period for both the ball carrier and the tackler to get a tackle-related injury, such as a concussion, with the reason being that the players lose their good tackle technique (Burger et al., 2016; Mc Fie et al., 2016; Burger et al., 2014; Clark et al., 1990). One possible reason for this is due to fatigue, which comes down to whether or not the players are properly conditioned, as well as conditioned for the 70-minute match at schoolboy level. It was identified that rugby requires a tackle conditioning programme (Hendricks et al., 2017). This programme would focus on the different contact situations that players from all ages are faced with, and how to condition them for these situations (Hendricks et al., 2017; Sewry et al., 2018; Sewry et al., 2019; Haseler et al., 2010). The programme would ensure that players can handle the contact situation at different intensities and different durations over numerous sessions (Hendricks et al., 2017). This programme thus has identified the need for players to be conditioned for the demands of the game, and has the potential to decrease the injury risk during a game.

During the Craven Week competition, there was a difference between the quarters of the game (1^{st}, 2^{nd}, 3^{rd} and 4^{th}) and the percentage of injuries occurring during those quarters. The third

quarter had the highest percentage, with 33% of all injuries occurring then (Starling et al., 2019). Further, there was a higher number of new injuries than recurrent injuries: 14 per 1000 playing hours compared to 4 per 1000 playing hours. The most common new injury was a muscular injury, while the recurrent injuries were mostly joint injuries (Starling et al., 2019; Sewry et al., 2018; Sewry et al., 2019; Haseler et al., 2010). Previous injuries can be a good predictor for future injuries (Starling et al., 2019).

Catastrophic injuries do occur in rugby, even if it's rare, and they impact the player as well as their families. In South Africa, there was a low rate of these injuries, occurring at 2 per 100 000 players, with spinal cord injuries accounting for 1 per 100 000 of these players (Brown et al., 2013). More recent research has identified that catastrophic injuries with rugby unions in South Africa range from between 1.8 and 7.9 per 100 00 players (Badenhorst et al., 2017). Acute spinal cord injuries on average effect 7.1 per 100 000 players (Badenhorst et al., 2017). These catastrophic injuries are more prominent at a senior level compared to junior level (Badenhorst et al., 2017; Brown et al., 2013).

There are common aspects regarding injuries between elite and schoolboy rugby players; however, further investigation needs to occur.

Injury Comparison

One of the most recent forms of adolescent rugby injury research has been done on the U18 Craven Week competition. This type of competition is arguably similar to the World Cup competition, which involves adult players, and this allows for comparisons between these two age groups. The first comparison that can be made is that there is a difference between injury incidence and injury type at the adult and schoolboy U18 level (Starling et al., 2019; Fuller et al, 2016; Sewry et al., 2018; Sewry et al., 2019). The most common injury at the adult level is muscular injury, whereas at an adolescent level it is concussion (Starling et al., 2019; Fuller et al., 2016; Sewry et al., 2018; Sewry et al., 2019). However, head injuries are still very common at the adult level, and muscular injuries were second most common at the adolescent level (Starling et al., 2019; Fuller et al., 2016; Sewry et al., 2018; Sewry et al., 2019). A commonality between the different groups was that the head and neck were the two most injured body locations; 22% for adults compared to 48% for adolescents (Starling et al., 2019; Fuller et al., 2016; Sewry et al., 2018; Sewry et al., 2019).

The injury incidence between the two age groups was different (Starling et al., 2019; Fuller et al, 2016), with backline players having a higher injury incidence than that of forwards at an adult level (Fuller et al., 2016). The adolescents also have a lower injury incidence rate than the adults (Starling et al., 2019; Fuller et al., 2016; Sewry et al., 2018; Sewry et al., 2019), with reasons possibly being the time frame between games as well as the number of practices that occur between games. It can also be because there are different demands, or even higher physical demands, for adults than adolescents. However, with minimal research into the adolescent game, this cannot be stated with confidence.

When comparing South African adolescents to other adolescent players across the world, there seems to be a similar trend concerning injury type and injury location (Archbold et al. 2017; Collins et al., 2008; Sewry et al., 2018; Sewry et al., 2019; Haseler et al., 2010). The most common injuries globally are concussions and muscular injuries (Archbold et al., 2017; Collins et al., 2008; Sewry et al., 2018; Sewry et al., 2019; Haseler et al., 2010). Two of the studies found that the most common injury mechanism is that of being tackled or tackling, both which are contact situations (Collins et al., 2008).

In general, injuries are a common occurrence in rugby no matter the age of the player or the level of play. Impact injuries are always difficult to prevent, while the muscular injuries are ones that can be, to some extent, prevented

In South Africa, rugby is one of our national sports, with children starting to play at a very young age. This sport is one way for adolescents to create an identity for themselves, as they are admired and looked upon as heroes when they represent their first team at school (Ellis, 2016). However, because of South Africa's past, we still have segregation within our society, which impacts children's ability to participate in rugby (as well as other sports). Therefore, it is important to understand the South African schooling system, as this then links to whether schools can hire appropriately qualified coaches and whether they even have strength and con

South African Schooling System

The South African educational system has two schooling categories, not including special need schools. The two types of schools are broadly categorized as public and private independent schools, which can either be single-sex or co-educational schools.

Public schools are the schools that are attended by the majority of South Africans, as the fees of these schools are mostly subsidized by the government (Department of Basic Education South Africa, 2016). Each province of South Africa has the responsibility of ensuring that their public schools are funded, as well as equipped with everything they need to run efficiently (Department of Basic Education South Africa, 2016). The government schools in South Africa are categorized into poverty ranges which then filter into what is called quintiles (Grant, 2013). The quintiles range from one to five; one being the poorest or most poverty struck and five being the least poor (Grant, 2013). In 2014 it was declared that the quintiles ranging from one to three were non-fee-paying schools, while quintiles four and five are fee-paying schools (Wilmot & Dube, 2015). The government schools do not have any say in which the educational system is adopted; they have to adopt the National Curriculum and Assessment Policy (Department of Basic Education South Africa, 2016). These schools often have a serious issue with a lack of financing and monitoring from the government. This can lead to many of their students receiving low standards of education. Often parents who can afford to send their children to private schools do so to ensure that they avoid these shortcomings from the public schools. Private schools are predominantly occupied by the more affluent population in South Africa. About 4.4% of the school-going population in South Africa were enrolled in private schools in 2016 (Department of Basic Education South Africa, 2016). These schools do not have to abide by the many standards that the government schools have to adhere to, due to them being allowed to use any educational system they choose as well as allocate resources as they see fit. The funding comes from the parents of the children as well as past pupils who are willing to donate money back to the school.

This often impacts participation in sport, as there is higher sport participation at higher socioeconomic status schools due to the access to better facilities (Klein et al., 2016). The inability to access the required facilities prevents an athlete from gaining good coaching, as well as from optimizing performance, placing the athlete in a disadvantaged position (Van Aarde, 2014). Furthermore, training, education and talent identification is minimal for players from lower socioeconomic backgrounds, causing significant challenges for aspiring rugby players.

Youth Rugby in South Africa

The game starts at a very young age in South Africa. Children start playing rugby at the age of six or seven years old, which is considered under nine (U9). They play until they are nineteen years old, which is classified as the U19 section. There were approximately twenty thousand players between the ages of seventeen and nineteen (U19 level) who left school in 2018 (Ruggas, 2018). Under nineteen is where adolescents can create an identity for themselves, as they are admired and looked upon as heroes when they represent their first teams at school (Ellis, 2016). Their talent is showcased at many derbies throughout a rugby season, as well as at the Craven Week provincial tournament. There are some derby days in South Africa where the first team match has drawn up to 25000 spectators, and the game is televised (Ellis, 2016). Thus, rugby in South Africa, at school level, has become an advertisement for schools. There is a great deal of pressure placed on these young players, with a 'win at all costs' mentality bestowed upon them (Bolligelo, 2006)

Schoolboy rugby teams now get ranked on their performances with a list of the top one hundred teams in the country. Anecdotally, South African rugby schools would like to be in the top twenty schools in the country, as this classifies the school as a good rugby school. These rankings are based on wins and losses. For example, if the number one school in the country lost to the number twenty school in the country, the number twenty would move up in the rankings while the number one could potentially move down. These rankings can be found on many websites with the most reliable being Schoolboyrugby.

In South Africa, there are three different provincial weeks for three different ages – U13, U16 and U18 – with these tournaments being designed to be the pinnacle of South African rugby's talent identification process (Durandt et al., 2011). The U13 week is for junior school children between the ages of 12 and 13 years. This U13 week is their first taste of representing their provincial team at a high-level rugby competition (Durandt et al., 2011). The method in which these teams get selected is based on trials; this means that the children who are the best get selected.

The next step in representing their province is at the under 16 (U16) Grant Khomo week (Rugby15, 2019). The method in which the teams get selected is once again through trials.

During this tournament, the best fifty U16 players get selected into a high-performance squad, called the green squad (Rugby15, 2019; Supersport, 2019).

The age group that has the most influence on a player's potential playing career is the under 18 (U18) age group, where they participate in the U18 Craven Week. The tournament has all the provincial sides represented, and is the biggest drawcard for rugby unions to contract players for professional rugby after school. During this tournament, a squad of twenty-three players, who are classified as the best players in their positions in U18 in the country, are selected (Rugby15, 2019). This, however, does not appear to be effective, as those playing at the U13 Craven Week do not always progress to the U18 Craven Week (Durandt et al., 2011). Only 24% of players who played in the 2005 u13 Craven Week went onto represent at the u18 Craven Week (Durandt et al., 2011). The reason for this could be two-fold; firstly, what determines talent at U13 may not be the same as that required at U18 level, and, secondly, players who were picked at U13 were more developed than their peers, with others catching up later at the U18 level (Durandt et al., 2011). The most likely explanation is that of later maturation for some players (Durandt et al., 2011), which is something that needs to be investigated further.

With respect to the South African schools rugby ranking system, there were no private schools in the top ten of the top 100 rugby schools at the end of the 2018 season. All the schools in the top ten were in the 4th or 5th quintile range. There were two private independent schools in the top twenty, with one of these being an all-boys school and the other a co-educational school. The 2019 season resulted in one all-boys private school being in the top ten 100 rugby schools (Schoolboyrugby, 2020). The top 100 rugby schools of the decade have recently been published, showing that there are no private schools within the top ten. There were, however, four in the top 20 for the decade, with all of them being all-boys schools (Schoolboyrugby, 2020).

Coaching rugby in South Africa is an area that is also impacted by our socioeconomic divide, with many of the better-qualified coaches, in terms of number of qualifications, coming from quintile four and five government schools and private schools (Arkell, 2016; Hunter, 2016). Lower quintile schools do not have adequate sporting infrastructure and coaches or correctly qualified coaches, and this is something that requires attention from SA Rugby as well as the South African education department (Klein et al., 2016; Department of Sports and Recreation South Africa, 2012).

To be a coach within the South African coaching system you are required to have completed certain accreditations. The most important course or accreditation is the Boksmart accreditation, as this is required as a coach to allow your team to play on match day. This accreditation is checked by the referee prior to the match beginning. This can be seen to one of the main issues, as this, according to the South African rugby union, is the only required accreditation to coach a team on a match day (SA Rugby, 2021). Thus, because of cost, lower quintile schools and coaches from those schools might not be able to complete this accreditation. This, therefore, affects the chance for players from those schools to participate in rugby.

Rugby Coaches' Education

There are three ways in which coaches can develop: learning through experience, formal coach education and action research (Evans & Light, 2008). Coaches develop their coaching philosophies by ongoing involvement with the game of rugby (Lyle, 2002). Experience for coaches plays an enormous role in their personal development (Abraham et al., 2006; Culver & Trudel, 2006; Dickson, 2001). Learning from past experiences can have some negative outcomes, as their ideas of best practice may not always be based on sound evidence, and the coach makes decisions on instinct and not factual knowledge (Evans & Light, 2008). Experience may, however, also have positive outcomes, and can assist with development, as it allows for personal and professional reflection (Abraham et al., 2006; Culver & Trudel, 2006). Formal education has allowed coaches to gain accreditation, which states that they can coach because they have passed a course. However, this formal education needs to be interrogated (Evans & Light, 2008, Dickson, 2001). Experience on its own is not the solution, whereas formal education and experience as a combination could benefit the coaches (Bell, 1997).

Rugby coaches across the world have different coaching courses that they can attain and gain accreditation from within their own country (Dickson, 2001). However, there are standard courses which can be completed through World Rugby (WorldRugby, 2020b). These courses consist of three different levels: level one, level two and level three, with an increased complexity with increasing levels (WorldRugby, 2020b). These three levels are used within South Africa as the form of coaching accreditation (WorldRugby, 2020b). The cost of these accreditations is not well known, as it is, according to the author's knowledge, not shown on

the website. This, however, might have the potential to be a reason that lower quintile schools do not have the access to these accreditations, or only have a few coaches that have been put through these accreditations. Therefore, this could be the potential reason for coaching knowledge being limited at the lower levels.

The World Rugby level one course is the basic starting point for accreditation as a coach, and requires no background in the game (WorldRugby, 2020b). The course teaches the coaches the basics of coaching, as well as the basics that are needed to be able to run one training session (WorldRugby, 2020b). It has no information regarding the demands of rugby or what is required of any level and age of the player during a match the basic rugby skills required. Level two of the World Rugby accreditation process has a few prerequisites such as: be actively coaching a team, over the age of 18 years, have completed the self-test at: www.worldrugby.org/rugbyready and www.worldrugby.org/laws and, finally, have completed a six-session diary (WorldRugby, 2020b). The course teaches the coach how to plan a six-week training programme, as well as increases the knowledge around the attacking and defending nature of the game (WorldRugby, 2020b). Level two still has no information regarding the demands of rugby and/or what is required by either adults or adolescents during a match.

Level three is the most complex of the three coaching levels, and it requires participants to be over the age of 21 years, be the head coach of a team and have completed level two (WorldRugby, 2020b). The course entails detail around the game of rugby, such as more in-depth analysis of the game, as well as more detail around the different aspects of rugby (WorldRugby, 2020b). However, it has no information regarding the demands of rugby and/or what is required by either adults or adolescents during a match.

The Boksmart course is required by any coach to be able to coach in South Africa, no matter their coaching qualifications or experience of coaching (Patricios, 2014). This programme exists as an injury prevention programme and strategy given the catastrophic level of injuries present in the sport (Patricios, 2014; Viljoen & Patricios, 2012). The program is an evidence based program and is driven by the relevant evidence on injuries, with policies that are in place to reduce the risk and chance of injures occurring, especially catastrophic injuries (Patricios, 2014; Viljoen & Patricios, 2012). The programme consists of four components: safety workshops, online material, the BokSmart Rugby Medic Program and the BokSmart Spineline

(Patricios, 2014; Viljoen & Patricios, 2012). The workshops are conducted by accredited officials and are free (Patricios, 2014; Viljoen & Patricios, 2012). The material online is evidence-based, and has practical illustrations of interventions (Patricios, 2014). The BokSmart Rugby Medic Program is a first aid course that is solely based on head, neck and spine injuries (Patricios, 2014; Viljoen & Patricios, 2012). The focus is on how to implement the appropriate immediate field side care for these injuries, with donations of essential equipment provided to the communities who are playing rugby that cannot afford it (Patricios, 2014; Viljoen & Patricios, 2012). The BokSmart Spineline is a hotline that can be dialed to gain advice and assistance with any head, neck or spine injuries, and with getting medical support to the required venue (Patricios, 2014).

This BokSmart programme is a relevant and needed programme within the South African context, but a limitation is that the focus is based on only the head neck and spine injuries that are the most severe types of injuries (Patricios, 2014; Viljoen & Patricios, 2012). In the South African context, the number of catastrophic injuries are two per 100 000 players, with spinal injuries being one per 100 000 players (Brown et al., 2013). Whereas at the youth provincial weeks, the injury incident rate was 29 per 1000 playing hours (Tee et al., 2017). The most common injuries at an adult level in South Africa were muscular, whilst schoolboy players were concussions; with these injuries occurring far more than the catastrophic injuries, which the BokSmart program monitors (Starling et al., 2019; Fuller et al., 2016). This does not mean that catastrophic injuries aren't important and do not require any support, but the programme should grow to include other relevant injuries, and injuries that are the most common. One way of doing this is by educating the coaches on the demands of the game, as well as how to prepare the players properly, which is currently not covered by any courses that the author is aware of.

It would be interesting to determine what coaches know about the demands of the game at different levels of play. This would be important to see where there are gaps in coach education and where programmes can be improved or expanded. Adequate knowledge around the demands of the game is important for appropriate training and injury prevention.

Strength and Conditioning Coaches' Education

Strength and conditioning coaches gain formal education predominantly through some form of Sports Science or Human Movement Science degree, which may make this field a more 'specialist' field. Therefore, the strength and conditioning field might be out of reach for lower quintile public schools.

Thus, it is important to note that there could be a difference in the understanding of the field in different levels of formal education. Strength and conditioning coaches are able to gain accreditations from completing courses through specific agencies that are respected and recognized within their context. For example, in the United Kingdom, they complete the United Kingdom Strength and conditioning association (UKSCA) accreditation and, in Australia, they complete the Australian strength and conditioning association (ASSA) accreditation. Within a South African context, most of the strength and conditioning accreditations do not come from a specific source; however, the National Strength and Conditioning Association (NSCA) course is a popular one.

The NSCA course can be completed by passing the theory and practical examinations (NSCA, 2018). The theory section covers numerous different sections, such as exercise science, sports psychology and nutrition, while the practical section covers exercise technique, programme design and athlete testing (NSCA, 2018). The course is a general accreditation course on the principles of strength and conditioning, with no content linking it directly to demands of sport (NSCA, 2018).

There are two rugby-related strength and conditioning courses, an introductory course and an advanced course, that are provided by World Rugby (WorldRugby, 2020c; Figure 1). The cost of these courses are free on the online website, whilst the Setanta College level course cost is unknown (WorldRugby, 2020b).

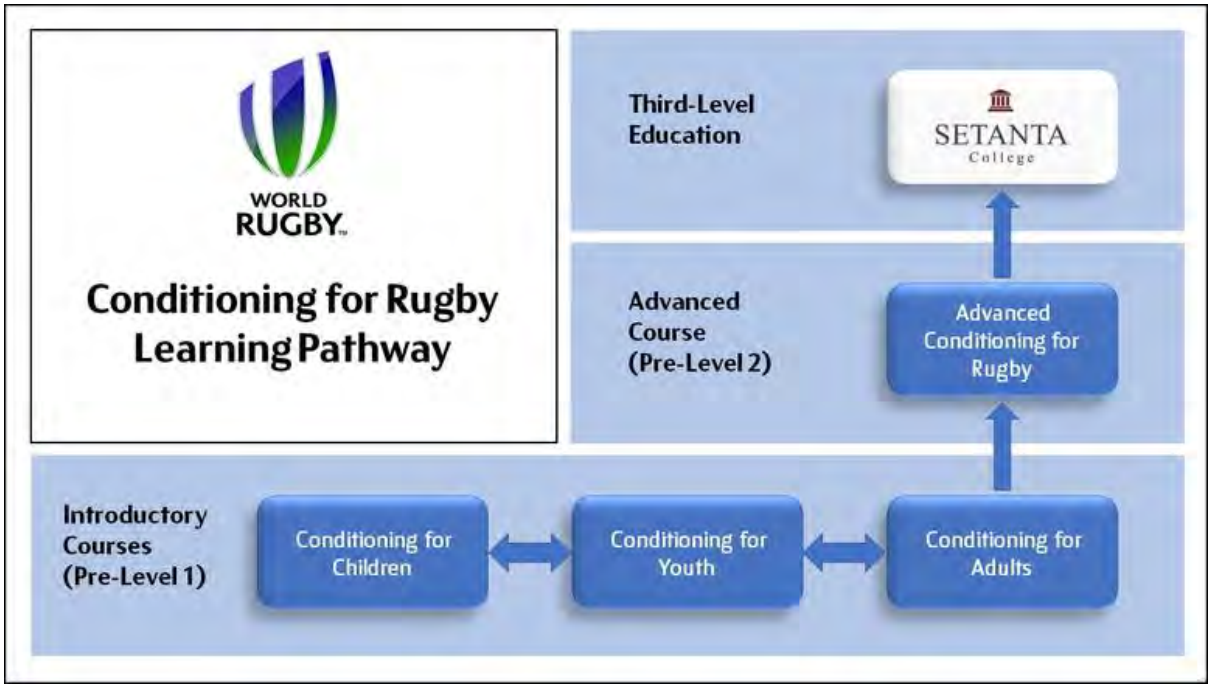

Figure 2: *World Rugby conditioning learning pathway* (Sourced: https://sandc.worldrugby.org/index.php?&language=EN)

The first phase focusses on children under the age of 13 years, with the main focus being around long term athlete development, warm up and cool down and conditioning for children (WorldRugby, 2020c) (Figure 2).

Phase two of level one is the conditioning for youth which focuses on athletes between the ages of 13 years and 18 years, with key themes such as long term development, functional screening, speed and agility and finally the game demands (WorldRugby, 2020c) (Figure 2). The game demands mentioned are the percentages of time spent standing, walking, jogging, sprinting as well as total distance covered (WorldRugby, 2020c). Work to rest ratio is very briefly described; this is the ratio between the amount of time that a player is working compared to the amount of time that a player is resting (Austin, Gabbett, & Jenkins, 2011; Deutsch et al., 2007). The demands are mentioned for different positional subgroups such as front row and loose forwards, inside backs and outside backs (WorldRugby, 2020c). There is a mention that the loose forwards have the most contact during a match but no other positions are covered in terms of contact (WorldRugby, 2020c).

The third phase is the adult conditioning section, which is based on players older than the age of 18 years (WorldRugby, 2020c) (Figure 2). Demands are far more detailed within this section, including details such as the energy systems used during different bouts of activities

(WorldRugby, 2020c). For example, the course states that the game revolves around high-intensity efforts, which requires the primary (ATP – CP) system and the secondary (anaerobic) system to be well developed (WorldRugby, 2020c). Work to rest ratio and contact situations are detailed within the course. Additionally, there is mention of the different positional groups and the number of contact situations (WorldRugby, 2020c). This is the first course for conditioning coaches that has a section on the implications that the demands have for training (WorldRugby, 2020). The advanced course is aimed to further prepare coaches with advanced techniques, it has the same sections as the above course, however more in-depth (WorldRugby, 2020c).

Strength and Conditioning in Rugby

Strength and conditioning is one avenue of sports science that attempts to maximize the performance of the athlete, resulting in positive outcomes in rugby performance by ensuring players are physically prepared, optimally trained and injury-free (Weakley et al., 2017; Smart & Gill, 2013; Lloyd et al., 2012a; Argus et al., 2012; Beaven et al., 2011; Hunter & Harris, 2008; Dorgo, 2009).

South African school-level coaches understand the need for players to improve their strength and power as well as gain size; however, they have a limited understanding of the movement demands of the game (Robinson et al., 2019). Further, there has been shown to be a limited amount of practice focusing on injury prevention, contact situations and actual distances covered (Robinson et al., 2019). South African school-level rugby coaches prescribed minimal aerobic conditioning, especially to positions such as centers and wings, whilst applying more aerobic training to the front row (Robinson et al., 2019; Macleod, 2016; Coughlan et al., 2011; Roberts et al., 2008).

As the different positions in a rugby team have different roles, players in different positions have different physical characteristics (Nicholas, 1997; Quarrie at al., 1996). The front row, as well as loose forwards, require strength and power, while the loose forwards also require speed, endurance and the ability to be mobile around the field (Quarrie et al., 1996; Nicholas, 1997). Locks are required to be tall, powerful and heavy, and the inside backs require endurance, speed, power, and strength (Quarrie et al., 1996; Nicholas, 1997). The outside backs need the

same requirements as inside backs, but require more speed than them (Quarrie et al., 1996; Nicholas, 1997).

Practices of strength and conditioning coaches have been investigated in various sports including cricket (Pote & Christie, 2016), rowing (Gee et al., 2011) and baseball (Ebben et al., 2005). Within rugby, there are only two studies that have looked at the same group of elite players (Jones et al., 2017; Jones et al., 2016). These examined the practices implemented by strength and conditioning coaches within elite rugby. The first study found that all participants believed that strength training had a fundamental benefit to rugby performance, with the clean and back squat being the most implemented exercises (Jones et al., 2016). The study was questionnaire-based, and consisted of seven sections (Jones et al., 2016). Interestingly, none of the sections inquired about the perceived demands placed on players or on-field conditioning questions except for speed and plyometric training questions (Jones et al., 2016). The sections focused more on "gym" or "weights" based questions.

The second investigation focused on determining whether or not the differences in playing styles between the Northern Hemisphere and the Southern Hemisphere correlates to differences between the strength and conditioning practices implemented in the different hemispheres (Jones et al., 2017). The Northern Hemisphere focused more on strength and power training compared to the Southern Hemisphere, which focused more on strength training (Jones et al., 2017).

There are two studies conducted in a South African context, one related to cricket and the other rugby at an adolescent level, that have investigated the strength and conditioning practices of coaches (Robinson et al., 2019; Pote & Christie, 2016). These two papers identified how education is a limiting factor in the correct implementation of conditioning practices (Robinson et al., 2019; Pote & Christie, 2016). One study showed that there was minimal knowledge on rugby conditioning, if any at all, within a South African context, as only 14% of the coaches who completed the survey had a strength and conditioning certificate or qualification (Robinson et al., 2019). It was noted that 68% of the coaches had some form of tertiary education; however, it was not stated whether or not it was science-specific.

The practice of conditioning requires complex actions and implementation of complex techniques, which requires knowledge from multiple sources (Jeffreys, 2014). Therefore, having one of these qualifications or certificates is a very valuable method in demonstrating competence in the field (Malek et al., 2002). Gaining knowledge and information through informal activities and social interactions has been preferred by some sports coaches, which has shown that coaches' education should rather be a mentor-based education instead of formalized education (Stoszkowski and Collins., 2016). The fact of the matter is that, in a field that has become more competitive, the better and more formal education a coach has, the more likely they are to implement effective practices (Tod et al., 2012).

It must be noted that, within a South African context, many strength and conditioning coaches at schools aren't just working with the rugby teams, but are also engaged with different sports (Weldon et al., 2020). Therefore, the solid knowledge of the correct techniques and periodization skills learned from the courses and certifications is important, as it will allow for good general strength training for all the different sports.

The number of years of experience of strength and conditioning coaches varied between zero years and over ten years (Robinson et al., 2019). Eighty percent of the coaches had more than five years' experience in their field, which has been shown to benefit the implementation of the correct conditioning protocols (Stoszkowski & Collins, 2016). Thus, it would be hard to refute the fact that the coaches in the Robinson et al., (2019) study actually would be able to implement the correct protocols due to them having a formal education and enough experience in the field.

Strength and Conditioning of Adolescent rugby players

Adolescent rugby players between the ages of 15 and 18 years of age are, from an athletic perspective, in their prime years of physical development (Arkell & Lambert., 2013; Lloyd et al., 2014). Adolescents in South Africa who play rugby within this age group have the potential to be involved in specific strength and conditioning programmes (Arkell and Lambert., 2013). When administering conditioning programmes to adolescents, it must be noted that they are going through a period called 'adolescent awkwardness' (Lloyd et al., 2012b; Lloyd et al., 2014). For example, during this period, it can be difficult for an adolescent to control their limbs and it may take longer for skill acquisition (Lloyd et al., 2012b; Lloyd et al., 2014). As

a result, they should not be treated as 'mini-adults' when prescribing strength and conditioning programmes (Arkell & Lambert 2013; Lloyd et al., 2012b). The reason for this is that the demands of the adolescent game are not fully understood, and the on field physical demands are different to that of adults or elite level, which lends itself to them requiring different training (Arkell & Lambert 2013; Lloyd et al., 2012a; Lloyd et al., 2012b).

As the game has become more professional at a schoolboy level, schools have seen the importance of strength and conditioning. This conditioning involves the development of physical and physiological characteristics, which all encompass a holistic athletic development program (Hibbert, 2010). In the game of rugby, having a physical and physiological advantage over your opposition has the potential to lead to team success, and can be achieved by an effective strength and conditioning programme (Sedeaud et al., 2012). However, the actual success of the programmes comes from the injury prevention (Lloyd et al., 2012b). Therefore, a crucial aspect to consider when designing a strength and conditioning programme is understanding the demands of the game, as well as the most common injuries that occur. This allows for better construction of the strength and conditioning programmes which may, in turn, allow for better injury prevention.

Adolescent rugby coach's perceptions of demands

The coach's perspective on rugby is somewhat not understood except for a few studies which have looked at a variety of aspects about elite coaches and schoolboy rugby coaches (Finn & McKenna, 2010; Hill, MacNamara & Collins, 2015; Thomas & Wilson, 2013; Bennie & O'Connor, 2010; Thelwell, Werken, Greenless, Hutchings, 2007; Chiwardizo, Munambah, Oorschot, Magume, Dambi, Ferguson & Smits-Engelsman, 2019; Woodcock, Holland, Duda & Cumming, 2011; Chiwaridzo, Ferguson & Smits-Engelsman, 2019).

A search on Google Scholar using the following keywords was performed: "schoolboy rugby", "demands" and "coach's perspective". Numerous search results for the different keywords were shown – however, there were no search results that included all three keywords in one result. Therefore, to the author's knowledge, there is no current research that has taken the coach's perceptions into account when looking at the demands of rugby.

When looking at the coach's perceptions literature, the underlying research themes are: Talent identification (Hill, MacNamara & Collins, 2015; Chiwardizo, Munambah, Oorschot, Magume, Dambi, Ferguson & Smits-Engelsman, 2019), the transition from amateur to elite level and the characteristics that could be beneficial or detrimental to the player's success, as well as stressors (Finn & McKenna, 2010; Bennie & O'Connor, 2010; Thelwell, Werken, Greenless & Huthchings, 2007;), and what coaches base selection of players on (Chiwaridzo, Ferguson & Smits-Engelsman, 2019; Chiwaridzo, Munambah, Oorschot, Magume, Dambi, Ferguson & Smits-Engelsman, 2019).

The following four themes were highlighted as important factors in the above coaching: physiological characteristics, anthropometric attributes, game-specific skills and psychological qualities. An interesting finding was that coaches used stature and mass as a measure for talent identification (Chiwaridzo et al., 2019) and good on- and off-field skills (Bennie & O'Connor, 2010). Fitness and physical qualities were thus found to be a major contributor to team selection (Chiwaridzo et al., 2019b).

This coach perception raises the question of whether or not the coaches are aware of the demands placed on the players during a match. As player fitness is a massive contributing factor to player selection, the coaches need to know the demands placed on the players and prepare players adequately for them. This may then allow players to be injury-free, playing more rugby and showcasing their actual skills (Orchard, 2002; Swenson et al., 2009; Hägglund et al., 2013). The emphasis for player selection can then be focused on aspects such as player skill, mental toughness and player coachability (Chiwaridzo et al., 2019a; Chiwaridzo et al., 2019b). This can assist with the potential success of the team, and the coach's success (Williams, 2015).

Summary

A minimal amount of research has indicated that the only known perceptions that coaches have of adolescent rugby is that they take notice of player fitness, ball skills and talent identification perceptions (Chiwaridzo et al., 2019a; Chiwaridzo et al., 2019b). Coach education can play a role in the understanding of the demands placed on players. However, the accreditation courses do not all cover the demands in any detail (WorldRugby, 2020b,c; Boksmart, 2020). The education of the strength and conditioning coaches concerning the demands of the game is also very limited, as the courses do not provide the coaches with sport-specific knowledge (NSCA,

2018). Determining the knowledge, through questionnaires and or interviews, that coaches have can assist in developing adequate coaching programmes. Coach education can result in a greater synergy in the coaching staff, improve their approach to the game and the conditioning of players.

CHAPTER III

METHODOLOGY:

Research Design

The study was a cross-sectional, descriptive study, with the data collection done on an electronic online questionnaire, implemented on Google Forms. The questionnaire consisted of both open-ended and closed-ended questions, which looked at quantitative and qualitative measures. It was used to investigate the current coaches' (including strength and conditioning coaches) perspectives on the physical demands, such as injuries, workload and impacts taken. As well as the positional demands, such as distances covered, number of sprints and time spent doing a movement, of schoolboy rugby players (U18/U19) in South Africa.

Participants

The participants were first team head and assistant coaches, as well as strength and conditioning coaches. They were recruited from the top 100 rugby schools in South Africa, according to the top 100 rugby schools list from 2019, (Appendix A). 2019 top 100 schools were used since COVID-19 impacted the rugby season and only allowed for a few games to be played during 2020. Further, it was expected that coaches from the Top 100 schools should have the best understanding of the positional and physical demands of the game. The contact details for the various coaches were obtained from the schools' websites, or by the researcher contacting the school's administration for the coach's details.

Instrument

Questionnaire Design

The questionnaire was designed on Google Forms and was not adapted from previous research as, according to the author's knowledge, there are no prior questionnaire that looks at the coaches' understanding of physical and positional demands of any rugby playing level. The demographic section of the questionnaire was, however, adapted from Robinson et al. (2019), as this was a previously used and validated questionnaire.

The questionnaire was made up of ten different sections with a total of 74 questions; eight being open-ended questions and 66 being closed-ended questions (Appendix D). Each of the ten sections were targeting different aspects of the demands of rugby.

The purpose of the open-ended questions was to allow for the coaches to be able to express their personal opinion, feelings and attitudes on the question asked. These open-ended questions had the appropriate amount of space for the coaches to type as much as they wanted.

The closed-ended questions had a particular purpose, which was to allow for a user-friendly questionnaire, as well as allow for comparisons between the coach's answers. These 66 questions were either multiple-choice questions or check box questions, allowing the choice of more than one option. There were also questions that required the coaches to rank positions in order from one to ten (Appendix D).

Questionnaire Sections

Section 1: Demographic Information — such as what school they work at, qualifications they possess from a coaching point of view, as well as academic qualification(s). This section had 10 questions.

Section 2: Coach's Perspective — demands of schoolboy rugby (U18/U19), consisting of 11 questions.

Section 3: Player Statistics — such as how many tackles were made and rucks attended, with only four questions.

Section 4: Movement Demands (Time Motion Analysis) — comparing the amount of time spent doing different movement characteristics between forwards and backs, done using nine questions.

Section 5: Movement Demands (Distance Covered) — This section consisted of five questions comparing backs against forwards for the amount of distance that is covered in the game.

Section 6: Movement Demands (High-Intensity Efforts) — There were eight questions in this section comparing the high-intensity demands for forwards and backs.

Section 7: Injuries — This section consisted of 10 questions relating to injuries, such as the most common cause or which position is more prevalent for which injuries, and more.

Section 8: Impacts — Only two questions were used in this section, determining which positional group has more impacts, as well as which position has the most impacts in a game.

Section 9: Workload Management — Nine questions were asked in this section such as whether or not the player's workload is monitored, as well as if coaches think the workload is higher or lower for certain positions.

Section 10: Research and Conditioning — This section asked questions that can be used for future research.

Ethical Consideration

Before the commencement of the study, ethical clearance from the Rhodes University Ethical Standards Committee (Pote20180823; REC-241114-045), Grahamstown, South Africa (Appendix E), as well as ethical approval from the Eastern Cape Department of Education, Western Cape Department of Education, Gauteng Department of Education, Free State Department of Education, Kwa-Zulu Natal Department of Education and Northern Cape Department of Education was obtained (Appendix F).

All the participants were informed in writing about the purpose, aims expectations, as well as any risks or benefits associated with the study. Each participant had the option of giving voluntary consent within the questionnaire, prior to the completion of the survey. Upon completion of the study, each participant received an email outlining feedback from the results of the study, if they requested.

The coaches were not required to provide their name for privacy and anonymity purposes, which prevented information being traced back to them. Schools names were asked within the questionnaire, with the only reason being to determine their position in the top 100 list. The

coaches were informed that by consenting they gave their permission for the data to be analysed for a publication. This information was all within the email as well as letter and questionnaire itself (Appendix B & C).

Pilot Study

A pilot study was conducted to verify the validity and reliability of the constructed questionnaire. The pilot study was done before the questionnaire was sent out to the target population.

Pilot study testing was done on an advisory group, which consisted of six people who were considered by the author as people who are experienced coaches in the field of rugby, as well as academics in the field with experience in questionnaire design of a similar manner and with scientific expertise in research design and testing.

The questionnaire was then evaluated by the advisory group, and feedback was given on the questionnaire. There were a few changes suggested by the advisory group. The changes were mostly to do with the wording of questions, as well as amalgamating multiple overlapping questions into one, with the last changes being around the practicality and user-friendliness of the questionnaire.

Experimental Procedure

The questionnaire was emailed to respective coaches and strength and conditioning coaches in charge of the different first teams of the top 100 rugby schools.

The email contained information to the participant (Appendix D) and a link to the online questionnaire (Coaches Perspective on School Boy (U18/U19) Rugby Players Positional Demands). They were made aware that they were under no obligation to complete the questionnaire, and that they were allowed to decline to participate at the start or during the during questionnaire.

Statistical Procedure

The data were collated by the Google Form, which then was exported to a spreadsheet (Microsoft Excel, Microsoft, Redmond, USA).

The data was then entered into the statistical programme and all analyses were done in R 2.14.0 (R Core Team, 2013), with a confidence interval of 95% ($p<0.05$).

The experience data was checked for normality using a Shapiro-Wilk test. The data were found to be non-parametric, ($p<0.05$). This resulted in a Wilcoxon test being used to compare private and government schools' experiences and to compare regular coaches and strength and conditioning coaches' experiences. A linear mix model was used to analyze for significance in experience between government and private school coaches, and between regular coaches and strength and conditioning coaches.

The academic qualifications and coaching qualifications, for both government vs. private schools, as well as regular coaches vs. strength and conditioning coaches, were analyzed through a Pearson's Chi-Square test of independence, as it was categorical data.

The open-ended questions were collated and summarized, which allowed for key themes to be determined from those questions, which were then used as direct quotes in the results section. The key themes were identified in accordance with previous publications on strength and conditioning principles (Ebben & Blackard, 2001; Ebben et al., 2004).

Cohen's d effect sizes (ES) were used to establish the degree of difference between government school and private school coaches experience, as well as coaches and strength and conditioning coaches experience. The criteria that was used for interpreting effect size was <0.2 trivial, 0.2-0.6 small, 0.6-1.2 moderate, 1.2- 2.0 large, and > 2.0 very large (Hopkins, 2004).

Assumptions

It was assumed that the coaches who completed the questionnaire did it to the best of their knowledge and ability. The coaches were assumed to be honest in completing the online questionnaire. It was assumed, due to the explanations provided in the questionnaire, that they understood the questions asked.

Limitations

The researcher had no control over whether the coaches would complete the online questionnaire. Coaches therefore were trusted to not google any of the demands and answer he

online questionnaire to the best of their knowledge. Thus, there was no control over whether or not the form would be filled in accurately or not.

De-limitation

The study was delimited to South African schoolboy rugby head and assistant coaches, as well as strength and conditioning coaches. Any other individuals who were not within this group but who completed the study were not used within the data analyses process, and were excluded from the study.

CHAPTER IV

RESULTS:

Background Information

The study had a response rate of 72%. Most of the responses, broken down in Table II, where from the Eastern Cape 17 responses (41.5%), with Gauteng at eight responses (19.5%) and the Western Cape seven responses (17.1%). There were four responses (9.8%) from both the Northern Cape and Kwa-Zulu Natal provinces, and one from the Free State. There were 23 responses from government schools (56.1%), while private schools made up the rest with 18 responses (43.9%).

Within the current study, there were 11 schools who were part of the 2019 top 20 schools list (Appendix A). Of the government schools that completed the questionnaire, 34.7% of them were in the top 20, whilst 16.7% of the private schools were represented in the top 20.

There was a significant difference ($p<0.05$) between the government schools' coaches' experience (11.8 years ± 8.8 years) and that of the private school coaches (6.3 years ± 5.3 years), with the former having more experience (Figure 3). The difference in experience between coaches at government and private schools equated to a moderate size (ES=0.7).

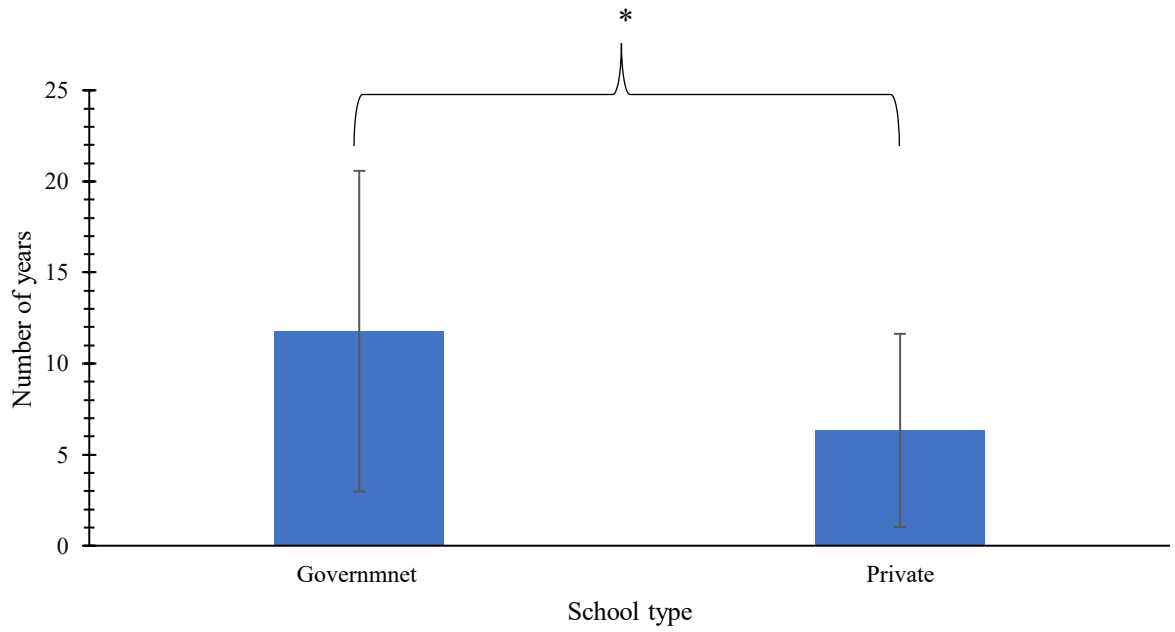

Figure 3: Years of experience for government school and private school coaches (* represents significant difference)

There was no significant difference in years of experience for the strength and conditioning coaches (7.4 years ± 4.6 years) and regular coaches (9.9 years ± 8.5 years). The difference in experience between coaches and strength and conditioning coaches equated to a small size (ES=0.3).

Demographic Information

The most common role within this study was the first team rugby coach role, with the director of rugby being the next most common role (Table II). There were only two strength and conditioning coaches who completed the questionnaire from schools within the top 20, one being from a government school and the other a private school.

Table II: Breakdown of the number of respondents from public and private schools

	Private School	Government School	Total Number of Coaches	Percentage of Coaches (%)
DoR	4	5	9	21.9
Head 1st Coach	8	10	18	43.9
A 1st Coach	1	1	2	4.9
S&C	3	5	8	19.5
Other	2	2	4	9.8
Total	**18**	**23**	**41**	**100**

Abbreviations: DoR=Director of Rugby; S&C=Strength and Conditioning Coach; A 1st Coach= Assistant 1st team coach

A bachelor's degree was the most common academic qualification (Table III), while an honours degree was the next most common. It must be noted that there were different certificates mentioned under the "other" category with the most common one being a post graduate certificate (Appendix D). Government school coaches had significantly ($p<0.05$) better academic qualifications compared to that of private school coaches. Strength and conditioning coaches had significantly ($p<0.01$) better academic qualifications than coaches. Regular coaches had significantly ($p<0.01$) better coaching qualifications compared to strength

and conditioning coaches. There was no difference between government and private school's coaching qualifications.

Table III: Breakdown of the number of respondents who have academic qualifications from public and private schools.

	Private School	Government School	Total Number of Qualifications	Percentage of Qualifications (%)
Matric	7	0	7	17.1
Bachelors	5	**12**	17	41.5
Honours	4	**8**	12	29.3
Master's	0	**1**	1	2.4
PhD	0	0	0	0
Other	2	2	4	9.7

The World Rugby level one and two courses made up 80.5% of the relevant coaching qualifications for the coaches. The level two course, however, was the most common course, with 63.4% of the coaches having this qualification for coaching. There were only three strength and conditioning coaches that had some form of accreditation or qualification. These qualifications were two National Strength and Conditioning Association (NSCA) and one World Rugby conditioning course accreditations. There was only one participant who stated that they had a Boksmart qualification.

Access to GPS Technology

The use of global positioning systems (GPS) technology was not common; only 15 participants (36.6%) responded "yes" to having this technology. There were eight private school participants and seven government school participants who made up these 15. The majority (61.5%) of the respondents who stated they do not have GPS technology were from government schools. Out of the 11 schools from the top 20, 54.5% of them use GPS technology.

Coaches' Perspective

The following section has figures that indicate all the responses from the participants for the questions pertaining to demands and movement patterns. The figures indicate that the coaches

had a variety of responses per demand or movement; thus, it was important to represent this variety.

The coaches identified the physical aspect of schoolboy rugby to be the most demanding factor during a match (Figure 4). Tied for the second most demanding factor during a schoolboy rugby match were the mental and physiological aspects, while the emotional and biomechanical aspects were perceived third and fourth most demanding by the coaches.

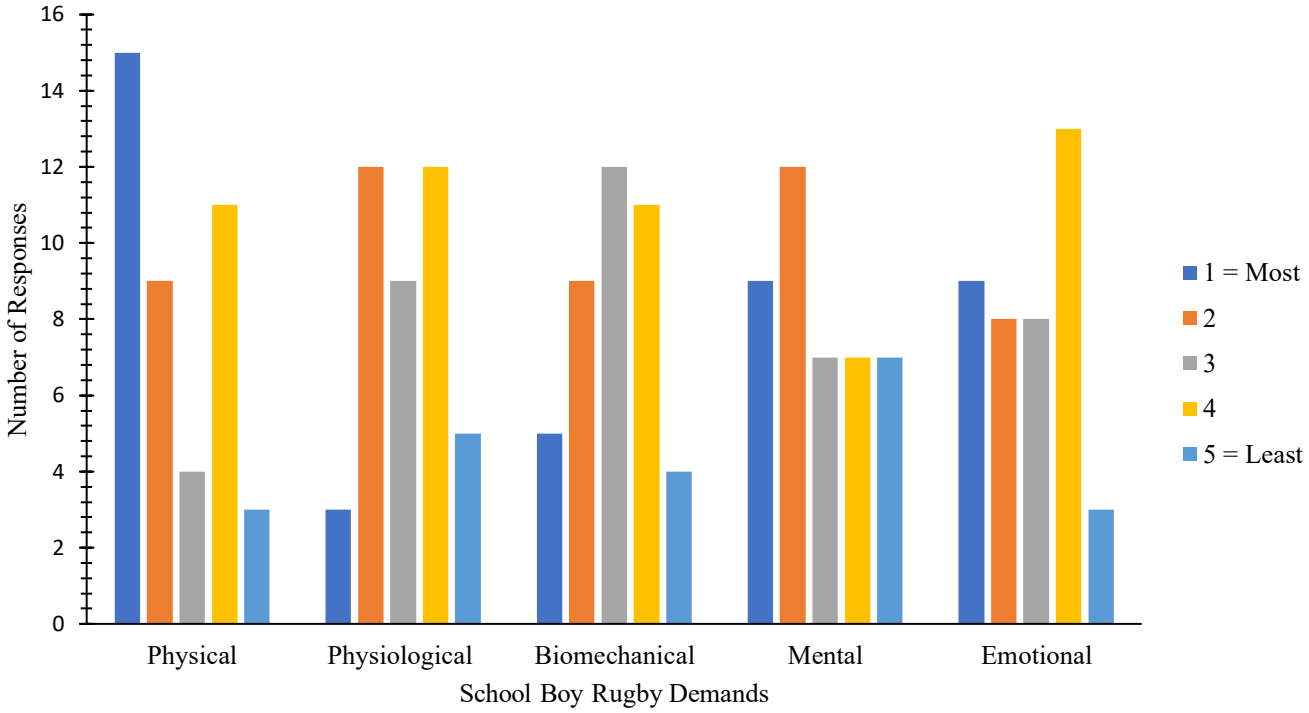

Figure 4: Breakdown of the number of responses per schoolboy rugby demand

Perceptions that match demands are different for different positions was prominent (n = 40) with 97.6% believing this; one coach did not believe this to be the case. The perceived reasons for the varying demands included the role in the team (95.1% of respondents) followed by physicality and game plan both having 68.3% responses. The skill and size of the player were also mentioned as a reason for the different demands, 63.4% of the responses.

Coaches perceived that both provincial schoolboy rugby games and adult rugby games had higher demands than regular schoolboy rugby games. This perception was by 92.7% (n=38) and 95.1% (n=39) of the coaches respectively. Coaches identified physicality as one of the main reasons for the demands being different for both the provincial schoolboy rugby match (75.6%) and adult matches (80.5%) compared to regular schoolboy matches. The other reasons identified were “size, skill and speed of the game”. Coaches also identified that the length of

the match could be another reason for the difference between adults and regular schoolboy match demands. The statement of "South African coaches choosing players based on anthropometric measures" was found to be true by 97.6% of the coaches (n=40), with 75.6% of coaches (n=31) perceiving that "South Africa is a forward dominant country".

Standing still was perceived by the coaches as the activity done the least by the backs, while walking and jogging was perceived by the coaches to be done the most (Figure 5). It must be noted that there was a variety of responses for the different activities (Figure 5 and 6).

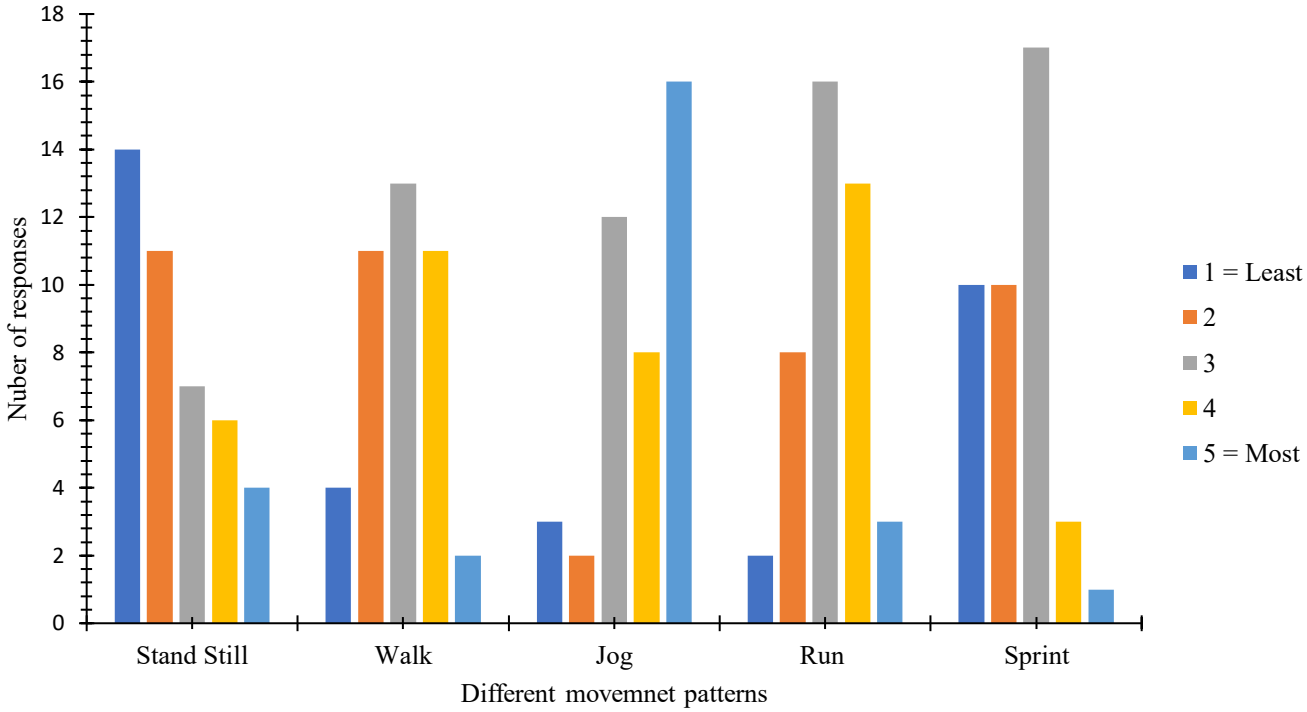

Figure 5: Breakdown of the number of responses per movement pattern (Backs)

The coaches perceived the forwards to have a different order of activities compared to the backs. "Jogging" was perceived to be the activity done the most by forwards while "running" was perceived to be done the second most. There was one similarity between the backs and the forwards: the coaches perceived them both to do "standing still" the least out of the activities.

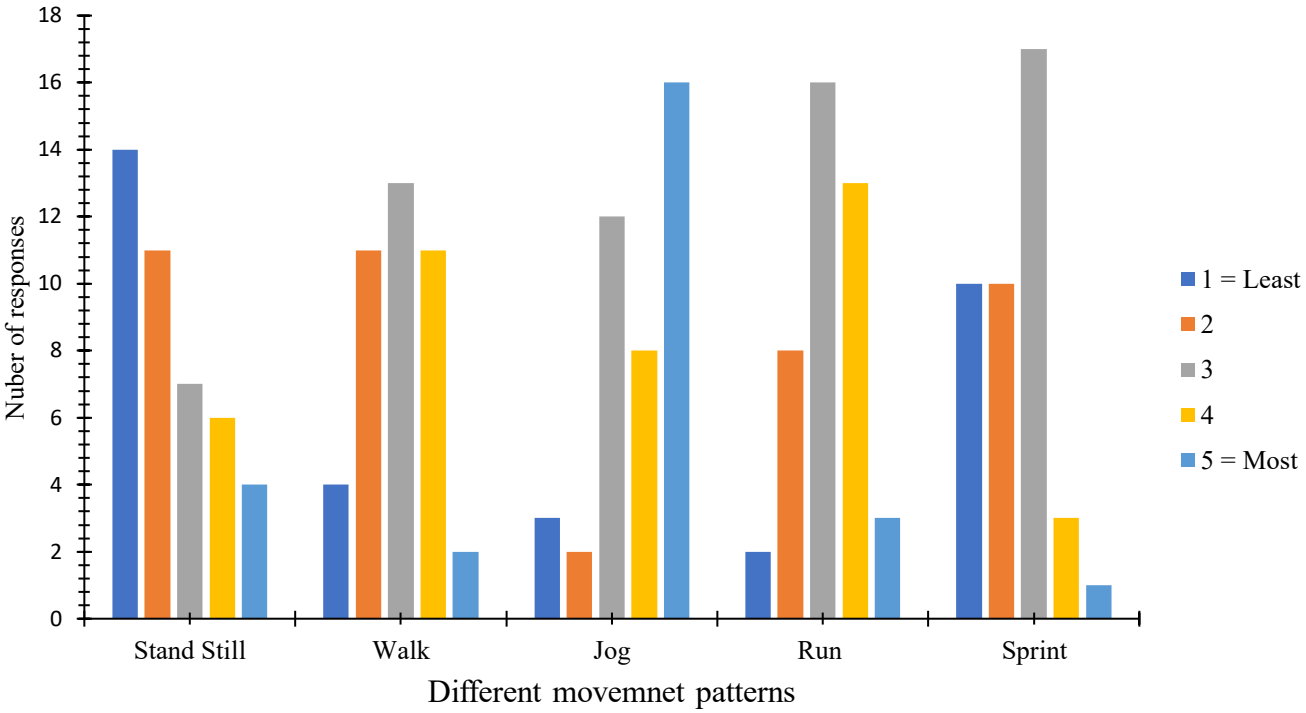

Figure 6: Breakdown of the number of responses per movement pattern (Forwards)

Player Statistics

Thirty coaches (n=30; 73.25%) indicated that they have player statistics at school. The "yes" answers consisted of 53.3% from government schools and 46.7% from private schools. The majority of the "no" answers came from government schools. These player statistics were found to be a useful coaching tool by all the coaches. Furthermore, all coaches stated that they would use it for match analysis.

Training purposes were identified by the coaches as the main use for the normative player statistics, with 38 responses (92.7%) (Figure 7). Match analysis and match tactics were seen to be the next method of use by coaches.

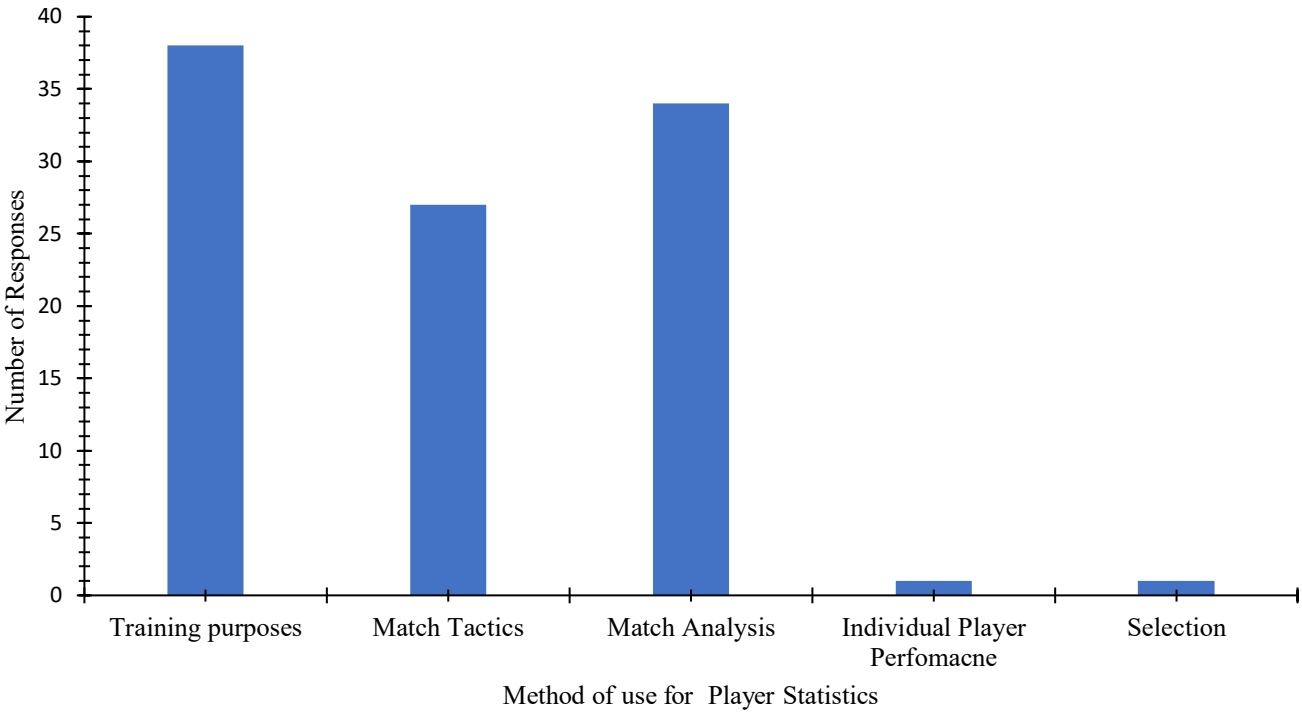

Figure 7: Breakdown of the number of responses per method of player

Movement Demands

Speed and Heart Rate

Adults were perceived to have the highest top speed, compared to schoolboy players, by 82.9% of the coaches. The adults were perceived to have the higher top speed by 91.3% of government school coaches and 83.3% of the private school coaches. All eight of the strength and conditioning coaches perceived adults to have the highest top speed.

The backline players at schoolboy rugby were perceived to have the highest top speed compared to forwards by 97.6% of the coaches. One out of the eight strength and conditioning coaches perceived forwards to have the highest top speed, whilst 95.6% of the government school coaches and 100% of the private school coaches perceived backline players to have the highest top speed.

Loose forwards, flanks and number eight make up the top two positions within the forwards to have the highest top speed (Table IV).

Table IV: Rankings of the forwards and backs for top speed (1=highest speed, 5=lowest)

Ranked Position	Forwards	Backs
1	Flanks	Wings
2	Number Eight	Scrumhalf
3	Locks	Centres
4	Hooker	Flyhalf
5	Props	Fullback

The wings were ranked by the coaches as the position within the backs to have the highest top speed as well as the highest average top speed (Table IV).

All the strength and conditioning coaches (n=8) perceived that the forwards had the highest average heart rate and 97.6% of the coaches (n=40) perceived the same. The one participant who perceived that it is backline players who have the highest average heart rate was from a government school. The coaches ranked flanks and number eight as one and two respectively in the order of the highest average heart rate. The top five ranked positions, for average heart rate, consisted of four forwards and one backline player. The wings and locks were tied for the sixth position, with the flyhalf being ranked seventh, fullback eighth and the scrumhalf last in at ninth.

Work to Rest Ratio

There was a perception by 80.5% of all the coaches that there is a difference between adults and schoolboy players' work to rest ratio. All the strength and conditioning coaches perceived the same difference. This perception was identified by 83.3% (n=15) of private school coaches and 78.3% (n=18) of government school coaches. Key themes for this difference were identified as "the speed of the game is faster; the intensity of the game is higher, and duration is longer for the adult game compared to the schoolboy game". The coaches also identified that the ball is in play for longer at an adult level compared to the schoolboy game.

The top five ranked positions of the highest work to rest ratio had four forward positions and one backline position (Table V). The coaches perceived the scrumhalf to have the highest work to rest ratio and the wing to have the lowest work to rest ratio.

Table V: Rankings of Work to rest ratio for different positions (1=highest and 10 lowest)

Position	Ranked Position
Scrumhalf	1
Flanks	2
Hooker	3
Locks	4
Props	5
Flyhalf	6
Centres	7
Number Eight	8
Fullback	9
Wings	10

The wings were ranked as the position with the most rest time, and the props were ranked as the position with the least amount of rest time (Table VI).

Table VI: Rankings of most rest time to least rest time (1=highest and 10 lowest)

Position	Ranked Position
Wings	1
Fullback	2
Flyhalf	3
Centres	4
Number Eight	5
Locks	6
Hooker	7
Flanks	8
Scrumhalf	9
Props	10

All the coaches from private and government schools, as well as the strength and conditioning coaches, perceived that the forwards spend the most time in contact situations. The coaches ranked the loose forwards, being the flanks and number eight, as the two positions respectively who spent the most time in contact situations.

Players were ranked by the coaches from the most time spent to the least time for different movement characteristics (Table VII).

Table VII: Rankings of positions from the most time to the least time in direct movement characteristics (1=most;10=least)

Position	Walking	Jogging	Sprinting
Props	2	8	8
Hooker	7	2	6
Locks	6	6	7
Flanks	8	9	4
Number Eight	9	3	5
Scrumhalf	**10**	**1**	**10**
Flyhalf	3	5	9
Wings	**1**	7	**1**
Centres	4	4	3
Fullback	5	**10**	2

Distance

Most of the coaches (63.4%) perceived that the forwards covered more distance than the backline players at a schoolboy level, with 66.7% of private school coaches and 63.4% of government school coaches following this trend. It was, however, found that only 68.3% of all coaches perceived adults to cover more distance than the schoolboy rugby players. Private school coaches perceived that adults covered more distance than schoolboys, and 69.6% of the government school coaches reported the same perception.

All the strength and conditioning coaches perceived that adults covered more distance than the schoolboy rugby players, with only 50% perceiving the backline players to cover more distance than the forwards at a schoolboy level. Most of the strength and conditioning coaches from government schools (60%) perceived that forwards covered more distance than the backs, with

66.7% of the strength and conditioning coaches from private schools perceiving backline players to cover the most distance.

Scrumhalves, at schoolboy level, were perceived by the coaches as the position that covered the most distance during a match. The flanks and number eight were perceived to cover the third and fourth most distance. The fifth position was tied between the fly-half and the locks, with both having 10 responses each.

The distances of ± 5000m, ± 6000m and ± 7000m received a cumulative total of 28 responses for adults per match. Distances of ± 4000m, ± 5000m and ± 6000m were perceived to be the most common by coaches for schoolboy rugby players per match (Figure 8). Adults were perceived to cover the distance of ± 7000m the most and ± 5000m the second most per match (Figure 8).

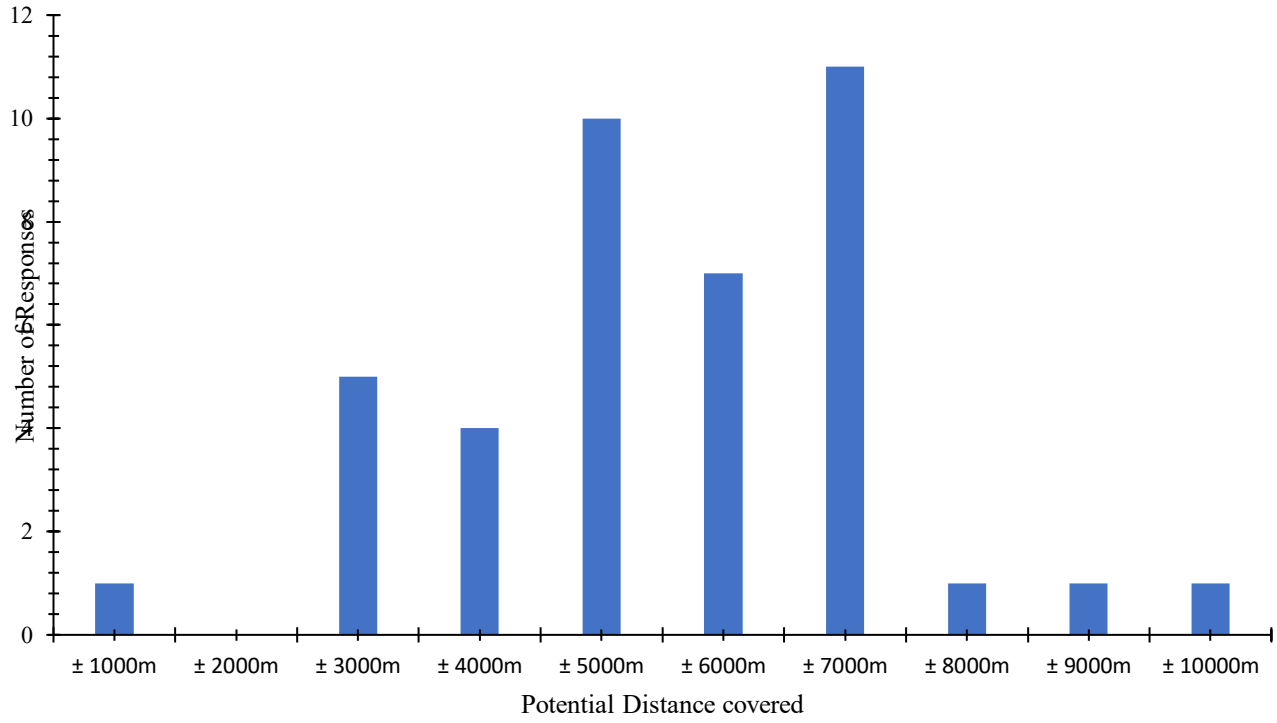

Figure 8: Breakdown of the number of responses per potential distance covered per match (Adults)

There were no responses to the distance of ± 2000m for adults, (Figure 8). Distances of ± 1000m and ± 10000m for schoolboys received no responses (Figure 9).

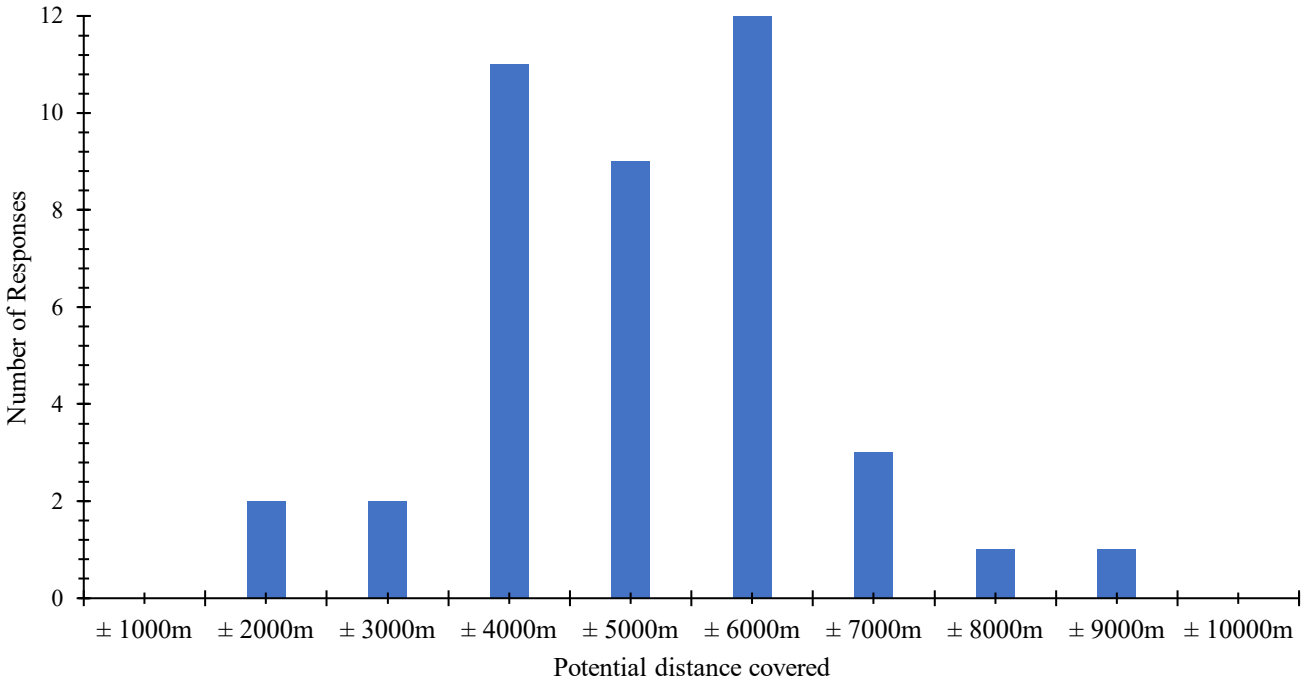

Figure 9: Breakdown of the number of responses per potential distance covered per game (School boys)

The most common distance, perceived by coaches, for the schoolboy rugby players was ± 6000m, followed by ± 4000m. Strength and conditioning coaches perceived that the adults covered ± 7000m, (87.5%), whilst 37.5% of them responded that schoolboy players cover ± 6000m.

Workload Monitoring

Workload monitoring was conducted at 69% of the schools, with 65.2% of government schools and 77.8% of private schools confirming this. The 31% of schools that did not implement workload monitoring were predominantly government schools, as they made up two thirds of the "no" responses. All the strength and conditioning coaches conducted workload monitoring at their respective schools.

Forwards were perceived by 97.5% of the coaches to have a higher workload than backline players with all of the strength and conditioning coaches perceiving that the forwards have a higher workload. The only coach to perceive backline players as having a higher workload came from a government school. There were themed reasons that coaches identified for forwards having a higher workload than that of backline players: "forwards are involved in the game more by taking part in set pieces as well as being involved in far more contact situations than that of the backline players."

Perceptions regarding a difference in workload between South African schoolboy rugby players and other countries' schoolboy rugby workloads was perceived by 75.6% (n=31) of the coaches. Most of the private schools' coaches (88.9%) and just less than two thirds (65.2%) of government schools coaches perceived there to be a difference. Three of the strength and conditioning coaches did not perceive there to be a difference in workload between South African schoolboy rugby players and other countries, while 62.5% of them perceived a difference. There were themes identified as possible reasons for the difference in workload or no difference in workload. These themes were that "the workload depended on the coach as well as what the coach required from the players, for example game plan, on a match day." They also stated that "the game speed of schoolboy rugby in South Africa is a lot faster", that "it is more professional in South Africa compared to other countries" as well as that "weather conditions would have an effect."

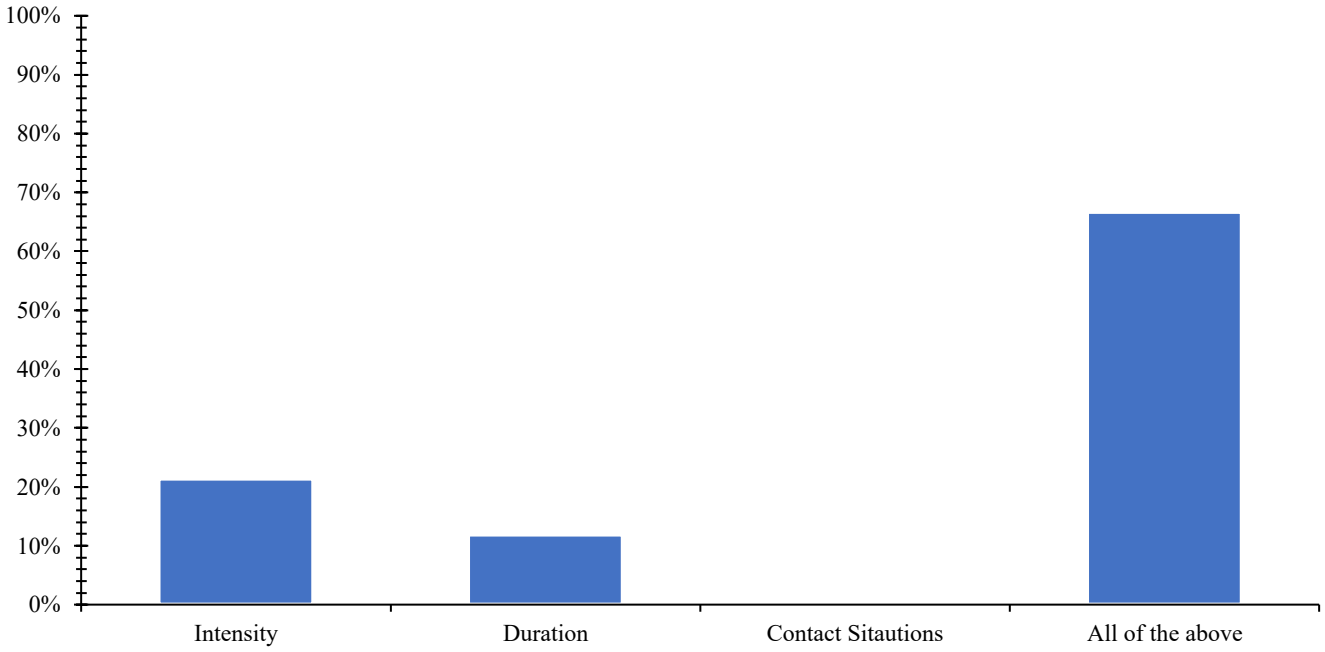

Figure 10: Percentage of responses for workload influence

The main factor affecting workload that was perceived by 68.3% of the coaches was the "all of the above" category (All of the above = Intensity + Duration + Contact combined) (Figure 10). Meanwhile, 19.5% of the coaches perceived intensity to be the main contributing factor to workload. All of the strength and conditioning coaches (100%) perceived the "all of the above" impacted players' workload.

All the coaches, including the strength and conditioning coaches, perceived that the workload between elite schoolboy rugby players was higher than that of non-elite schoolboy rugby players. Common reasons for this were that "the intensity of the game is higher for the elite schoolboy players" as well as that "they have more training sessions, such as longer and tougher sessions compared to the non-elite schoolboy rugby players."

Impacts

Most coaches, 39 out of the 41 responses (95.1%), perceived the forwards to have a higher impact count than the backs. The flank position was perceived by the coaches to experience the most impacts and the props the least. The order in which the coaches perceived the impact count, from most to least, was: flanks, number eight, hooker, locks scrumhalf, centres, wings, flyhalf, fullback and, finally, the props.

Injuries

"Previous injuries are a good predictor for future injuries" was seen to be true by 85.4% of the coaches, with only six not agreeing with that statement. Adults were perceived to have a higher injury incident rate, with a 58.5% response rate compared to the adolescents, who only got 41.5% of the responses. Forwards were perceived to be the positional group that had the most time loss injuries (85.4%) and medical injuries (73.2%).

The "tackle event", "being tackled" (n=34) and "being the tackler" (n=33) were perceived as the most common causes for injury within schoolboy rugby players. The most common injury was perceived as a concussion (82.9%), followed by ligament sprain (58.5%).

The in-season period was perceived to be the period that the most injuries occur, with 38 out of the 41 responses perceiving this (Figure 11). The pre-season was the next most common period for an injury to occur, whilst the off-season period was the period perceived to have the least number of injuries.

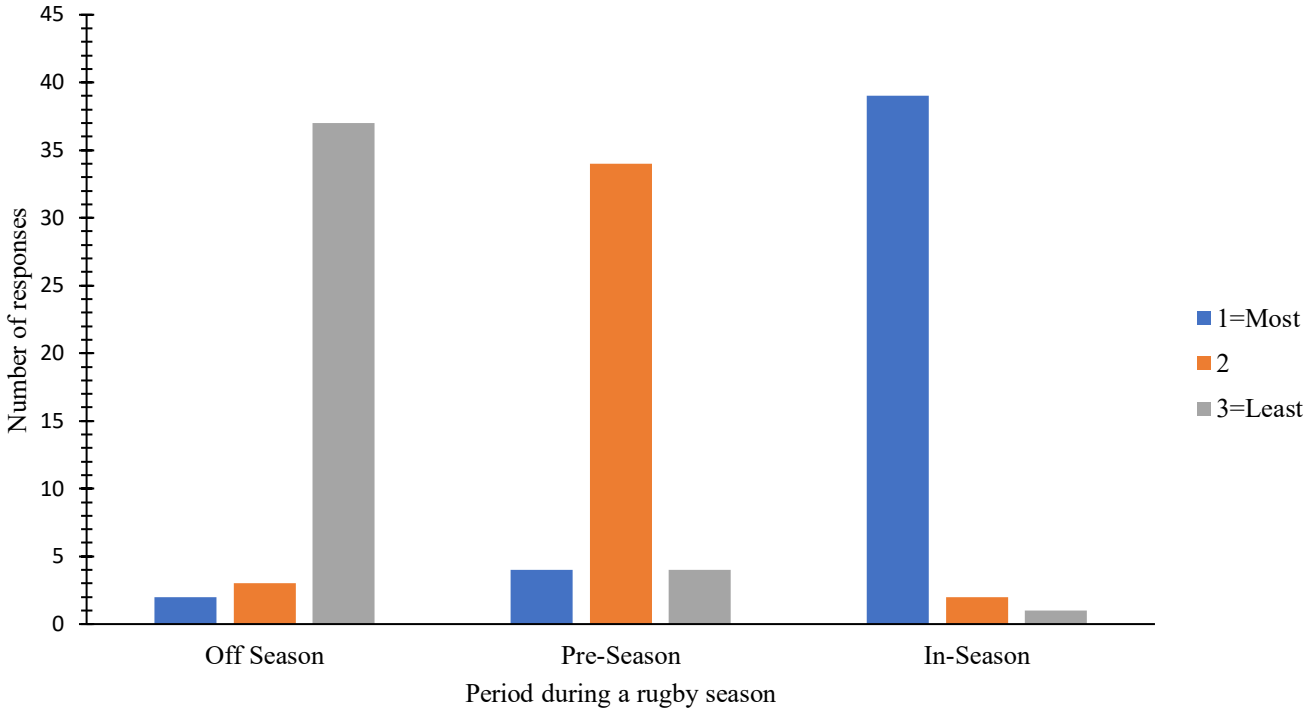

Figure 11: Breakdown of the number of responses per rugby season period

The coaches perceived that, during a match, the fourth quarter was the most common period on a match day for an injury to occur, with the least number of injuries occurring during the cool-down period. A perception the coaches had was that the warm-up period was found to be the second most common period on a match day for an injury to occur.

There were 82.9% (n=34) of the coaches who stated that they had an injury monitoring system at their school, consisting of 17 private and government schools. The "no" responses consisted of 85.7% from government schools, with only one response coming from a private school.

Research and Conditioning

All the coaches (n=41) indicated that normative data and scientific information on the schoolboy demands would be useful as well supportive in pre-season structuring.

Specific gym programmes were provided to the players by 94.4% of private schools (n=17), and87% of government schools (n=20). Six out of the eight (75%) strength and conditioning coaches provided their players with positional specific conditioning programmes.

Only 31.7% of the coaches stated that their players, from different positions, receive the same strength and conditioning during the off-season and pre-season. Seven out of the eight strength and conditioning coaches provided their players with different conditioning during the off-season and pre-season. The private schools (66.7%) (n=12) do not provide the players with the

same conditioning, while 69.6% (n=16) of government schools stated that their players do not receive the same conditioning during that period.

Government schools (39.1%) had a higher tendency to condition the different positions within the backs and the forwards the same compared to private schools (33.3%). There were two (33.3%) strength and conditioning coaches that provided the different positions with the same conditioning.

Summary

To summarize, there was significantly ($p<0.05$) more experience in government schools' coaches. No significant difference was found between the years of experience for the strength and conditioning coaches and the regular coaches. Government school coaches had significantly ($p<0.05$) better academic qualifications compared to private school coaches. Strength and conditioning coaches had significantly ($p<0.01$) higher academic qualifications than regular coaches.

Overall, the coaches perceive that the forwards were involved in more activities than the backline players. These activities ranged from being involved in more of the contact situations than the backline players, as well as covering more distance. This was the same for injury with the perception that forwards are more prone to both medical and time loss injuries. The tackle event was perceived by the coaches as the cause for most of the injuries in a match. Coaches would like data as a coaching tool and most provided different programmes to the different positional groups.

CHAPTER V

DISCUSSION:

This is the first study to describe the perception 1st XV high school level coaches and strength and conditioning coaches have on the demands of rugby. The area of coaching and strength and conditioning for rugby within South Africa is seen as a male-dominant field, as all participants who completed the survey were male. This is in line with previous rugby coaching and conditioning research that had less than five percent of females take part (Jones et al., 2016; Jones et al., 2017). Cricket coaching and conditioning coaching at school and university level, within a south African context, also tend to be a male-dominated field, as shown in previous investigations (Pote and Christie, 2016). A possible reason for this is that the more male-dominated sports in South Africa have a higher amount of funding to employ the required personnel. However, there are more and more female sports being played at a higher level. This could, therefore, lead to a change in this over time.

A combination of experience and academic qualifications may result in a better coaching method, which may ultimately lead to coaching success. Government school coaches had significantly ($p<0.05$) better academic qualifications than private school coaches. This may be associated with more government schools being in the top 20 rankings (Table III) (Appendix A). The number of government schools in South Africa is higher than the number of private schools, which itself might also lean towards a reason for more government schools present in the top20. Another possible reason for this success is that years of experience in coaching should not be taken for granted (Mallet et al., 2009; Abraham et al., 2006; Culver & Trudel, 2006). Government school coaches were found to have significantly more ($p<0.05$) experience than private school coaches with no difference in coaching qualifications. This highlights that informal knowledge gained through experience can facilitate personal and professional development as a coach (Mallet et al., 2009; Abraham et al., 2006; Culver & Trudel, 2006).

Therefore, potential reasons for more government schools within the top 20 rugby schools can be a combination of experience and better academic qualifications. Additionally, coaching qualifications, which affect rugby demand perceptions, may also play a role in coaching success. These perceptions may impact overall performance, as well as potential risk of injury.

However, another big factor could be due to the fact that there are just more government schools in South Africa so these considerations are speculative.

Within this study, 33 coaches had limited knowledge of the demands of school boy rugby players. There was little known about the factors that affect players' performances such as optional demands, injuries and workload. The reason could be that they do not have this necessary knowledge in that the World Rugby level one and level two course for coaches, which is the main coaching qualification in South Africa, does not have any relative information regarding rugby demands (WorldRugby, 2020b). Coach education has been previously highlighted as a limiting factor for coaches within a South African context (Robinson et al., 2019; Pote & Christie, 2016), which was also shown in this investigation. This limited coach education, especially around coaching proper tackle technique, may be a possible reason for the tackle event being the most common cause for injury (Fuller et al., 2007a; Hendricks & Lambert, 2010; Nicol et al., 2010). Furthermore, it was shown that the positional group affected most by injuries were the forwards, particularly in terms of time loss and medical attention, which is supported by previous research (Quarrie et al., 2001; Brooks et al., 2005a; Fuller et al., 2008b). The fact that the forwards are perceived by coaches as experiencing the most injuries could be due to the fact that they also perceived this group as being involved in the most contact situations. This would suggest that effective methods are needed to reduce these tackle- and contact-related injuries.

Coaches also perceived that the concussion is the most common injury in schoolboy rugby, which contrasts with previous research in South Africa, which identified the shoulder region as the most commonly injured area. (Robinson et al., 2019; Garraway et al., 2000; Brooks et al., 2005a; Brooks et al., 2005b; Headey et al., 2007). This is further supported by previous research, which found that the head, neck and upper limbs were the most common injury sites (Beer,1991). The fact that these are the most common injuries perceived by coaches supports the fact that the tackle event is the most common cause for injury (Fuller et al., 2007a; Hendricks & Lambert, 2010; Nicol et al., 2010).

It has been shown that having a rugby tackle programme may be a potential way of decreasing these tackle related injuries (Hendricks et al., 2017) This programme focusses on the contact situation, and how to ensure safety throughout (Hendricks et al., 2017). Therefore, it needs to be run in conjunction with strength and conditioning based on the game demands, as rugby is multifaceted in nature (Williams et al. 2016; Gamble, 2004). The success for strength and

conditioning coaches comes down to the preparedness of the players, as being prepared will allow them to withstand the game's demands and ensure that the risk of injury is reduced (Robinson et al., 2019; H gglund et al., 2006; Orchard, 2002; Swenson et al., 2009; H gglund, 2013; Williams, 2015).

There is a need to better understand the injury mechanisms and, importantly, devise proactive measures in an attempt to at least reduce but, also prevent, injuries (Bleakley et al., 2011). One of the proactive measures that can be used is workload monitoring (Borresen & Lambert, 2009; Gabbett, 2007; Gabbett, Hulin, Blanch, & Whiteley, 2016). This method has been used to reduce injuries, especially muscular and overuse injuries, and to ensure that players remain performing at an optimal level (Borresen & Lambert, 2009; Gabbett, 2016; Windt & Gabbett, 2017; Coutts et al., 2007; Gabbett et al., 2014).

It was found that there are similarities between this study and previous studies conducted within South Africa, regarding workload monitoring (Robinson et al., 2019; Pote and Christie, 2016). The method of workload monitoring was not asked within this study, whilst previous research of the strength and conditioning coaches indicated the use of session rating of perceived exertions, or sRPE as the most common method (Robinson et al., 2019; Pote and Christie, 2016). This method is a combination of the subjective rating of intensity with objective measure of duration (minutes). Session rating of perceived exertion was proven to be valid and reliable in monitoring physical loads (Scott et al., 2013). This holistic approach, however, has been found to not be ideal for the sport of rugby, as it cannot account for the intensity of the collisions that the players experience as well as the physiological damage that the collisions can cause to the body (Lambert & Borresen., 2010). Coaches perceived that forwards, at schoolboy level, had the higher workload, which is aligned with current research (Bradley et al.,2015a; Bradley et al., 2015b; Phibbs *et al.*,2017). This is not unexpected, as research has identified the fact that forwards are involved in more contact situations compared to backline players (Costello et al., 2018; Macleod, 2016; Owen et al., 2015; Suarez-Arrones et al., 2014; Cunniffe et al., 2009), which was identified by the coaches as one of the possible reasons for the higher workload. Therefore, measuring workload to prevent contact injuries is not necessarily possible, as the tackle event comes down to technique more than it being an overuse injury. The technique that a player uses to tackle is something that is coached, which can thus be affected by the coaches' experience and coaching qualifications, as highlighted previously.

The strength and conditioning coaches in this investigation had significantly ($p<0.01$) better academic qualifications than actual coaches – this agrees with previous rugby-related research in South Africa (Robinson et al., 2019). The number of strength and conditioning accreditations reported in this study were similar to previous strength and conditioning research in South Africa (Robinson et al., 2019), which was in contrast to studies looking at elite players (Jones et al., 2016). This could be because, at a professional level, certain qualifications may be needed to advance an individual's career. This is compared to schoolboy level, where employers might prefer tertiary education compared to certification or accreditation, as it demonstrates more competency (Tapley et al., 2014). However, in this study, it has shown that experience of coaching enables coaches to understand what players experience in respect to distance covered. The strength and conditioning coaches, who were shown to have better academic qualifications, were also found to have the better understanding of the distances covered. Strength and conditioning coaches might lack accreditations, (NSCA/UKSCA); however, they make up for it in years of experience, with an average of 7.38 years (± 4.6 years). Therefore, a combination of academic qualifications and years of experience may be a precursor to success as a coach particularly due to having a better understanding of player demands.

As not all of the schools had access to GPS technology, one would have presumed their perceptions of the demands would be minimally aligned with research. The marginal differences that have been noted between research and the coach's perceptions may be impacted due to the variances that can occur with different GPS technology (Quarrie & Hopkins, 2007). Coaches may also make use of different team tactics, which would, in turn, affect the distances covered by the individual players (Quarrie & Hopkins, 2007). Furthermore, most research has been performed on a Northern Hemisphere cohort, where different playing styles and weather conditions occur compared to the Southern Hemisphere.

Coaches perceived that the fourth quarter within the 70-minute match to have the most injuries occurring, due to the players being fatigued as well as being involved in multiple collisions. As a result, match preparation of the players, through strength and conditioning, needs to be based on game demands, which in turn will ensure the players are resistant to fatigue during a match. This was found to be aligned with research, which stated that the greatest number of injuries occur during the second half of the match compared to the first half, most likely due to the fatiguing nature of the game (Bathgate et al., 2002; Brooks et al., 2005a). Coaches also perceived the physical aspect to be the most demanding on the players, which is linked with

research around player fitness and player physical qualities that are used for team selection (Chiwaridzo et al., 2019b). Collisions and sprints, two examples of the physical demands placed on the players, and their preparation for these demands, would affect their ability to deal with the demands.

The physical aspects that players experience is different for various positions (Nicholas, 1997; Quarrie at al., 1996). The loose forwards, for example, require strength, speed, endurance and the ability to be mobile around the field (Quarrie et al., 1996; Nicholas, 1997), while outside backs require more speed (Quarrie et al., 1996; Nicholas, 1997). The specific roles of each position, therefore, need to be based on the specific demands of the game; a perception that the coaches agreed with.

Furthermore, it was perceived by the participants that the demands placed on adults and schoolboy players are different, which has also been shown in previous research (Cunniffe et al., 2009; Read et al., 2017; Hartwig et al., 2009; Deutsch et al., 1998; Macleod, 2016; Coughlan et al., 2011; Roberts et al., 2008). This has been shown through GPS technology that records the different movement patterns of players (Cahill et al., 2013; Coughlan et al., 2011; Cunniffe et al., 2009; Austin et al., 2011; Deutsch et al., 2007). A higher percentage of private schools in this study used GPS technology to monitor their player demands, most likely due to the funding and resources these institutions have available to them. Another possible reason for more private schools using GPS technology is as a coaching tool to assist with minimizing the gap in performance currently seen between government and private schools. However, this has not yet been seen to be the case in the top 20 schools. Within the current study, there were more schools making use of GPS technology compared to previous research within a similar cohort (Robinson et al., 2019).

Coaches and strength and conditioning specialists perceived that adult players covered greater distances than schoolboy players. Coaches believed that adult players covered between 5000m to 7000m in a game, which is like research that stated that senior rugby players covered 6950m on average per game. (Cunniffe et al., 2009; Read et al., 2017; Hartwig et al., 2009; Deutsch et al., 1998; Macleod, 2016; Coughlan et al., 2011; Roberts et al., 2008). Schoolboy rugby players were perceived to cover between 4000 m and 6000 m in a game, which was also like previous research showing that schoolboys cover, on average, 4940 m per game. (Cunniffe et al., 2009; Read et al., 2017; Hartwig et al., 2009; Deutsch et al., 1998; Macleod, 2016; Coughlan et al.,

2011; Roberts et al., 2008). Strength and conditioning coaches had a more accurate perception of the distances covered for both adults and school boy players, ± 7000 m and ± 5000 m respectively, which is likely due to the fact that they are more familiar with game demands, particularly for the design of scientifically based training programmes. Another possible reason for this accuracy is that preparation of the players is seen to be the strength and conditioning coaches' job. However, some schools, especially in a South African context, do not have the funding to employ such a person, and the regular coach might therefore be responsible for this task. Thus, they need to be able to apply the knowledge of the demands into preparation of the athletes.

Backline players have been identified as the positional group who cover the most distance at both school boy U18 and adult rugby (Read et al., 2017; Macleod, 2016; Coughlan et al. 2011; Hartwig et al., 2009; Cunniffe et al., 2009; Deutsch et al., 1998; Roberts et al. 2008), whereas the coaches perceived forwards at schoolboy level to cover the most distance. This perception can potentially be linked to coaches perceiving South Africa to be a forward dominant country. Another possible reason could be that coaches have not been educated on the distance demands per positional group, as well as not having coaching qualifications that could assist them with this knowledge.

Scrumhalves were perceived, by the coaches, as the position that covers the most distance, which is the contrast to which positional group they perceived to have covered the most distance, being the forwards. There is no evidence for schoolboy rugby to support this perception; however, at an elite level, the scrumhalf position was found to cover the most distance in the Northern Hemisphere professional league (Cahill et al., 2013). The scrumhalf position within this study was identified as the position with the highest work to rest ratio, which contrasts with previous research that stated that loose forwards, flanks and number eight had the highest work to rest ratio (Deutsch et al., 2007). Possible reasons for this could be the team tactics that have been employed by the coach, which would affect what they required the players to do. This, therefore, would cause a change or a variation from the norm in work to rest ratio data. Game plan or style that has been used by the coach could also play a role.

Research identified that forwards and backline players have different top speeds as well as distances during sprinting (Coughlan et al., 2011; Cunnifee et al., 2009). It has been identified that forwards have a top speed of 6.8 $m.s^{-1}$, whilst backs reach a top speed of 7.7$m.s^{-1}$ (Macleod,

2016; Coughlan et al., 2011). Coaches' perceptions were aligned with this, as they perceived backline players had a higher top speed than forwards. Perceptions surrounding adults and schoolboy players found that adults were perceived to have a higher top speed compared to schoolboy players. A possible reason for this is that adults are more developed as a result of being exposed to better conditioning practices for a longer period of time compared to school boys as well as having matured physiologically (Lloyd et al., 2012a; Lloyd et al.,2012b).

While coaches may not be sufficiently qualified, they have shown that their experience in coaching has allowed them to have a good perception of the demands. These perceptions have allowed them to prepare their players according to the fact that individuals are different and require different needs to manage their specific demands. Coaches identified that their players are not conditioned the same, and that they provided their players with specific, individual conditioning programmes. Both private and government schools were seen to apply player-specific programmes to their players, whilst private schools have significantly less experience than government schools. This difference in specific programmes can potentially be explained by the fact that private schools would have more financial assistance available to them to provide this specificity to their players.

Current findings have shown that coach education potentially needs to be altered to ensure that coaches receive the relevant education regarding demands of the game, as well as how to properly prepare their athletes for the game of rugby. Coach education, once changed, needs to be made a priority to allow for all coaches in South Africa to have access to it. Experience was shown to carry the coaches through their coaching, whereas if they had a combination of both good coach education and means of applying this education to coaching situations it would benefit the athletes.

CHAPTER VI

Summary, Conclusion, Practical Recommendations and Future Research:

Summary

The coaches have a good idea of what the demands are that the players are faced, even though they have not actually been educated on this matter (suggesting no formal education the author identified within different coaching qualifications available). This shows that experience in coaching rugby plays a big part in understanding the game which can affect a team's performance. Therefore, this experience has been seen to have the potential to carry the coach's knowledge of both the coaching of the game and understanding the game. The coaches need to be educated more on how to apply their coaching experience and perceptions, of the demands, into practice. This may allow for the better preparation of the players. This would in turn ensure that players are able to last the full 70-minutes and remain injury free.

Conclusion

The aim of this study was to investigate what the perceptions of coaches, both coaches and strength and conditioning coaches, of schoolboy rugby players match demands were.

Hypothesis 1: Ho: μpce = μgce; Rejected

The null hypothesis is rejected due to government school coaches having significantly ($p<0.05$) more experience than private school coaches.

Hypothesis 2: Ho: μce = μsce; Accepted

The null hypothesis is accepted due to no difference being found between coaches and strength and conditioning coaches experience.

Hypothesis 3: Ho = $\mu cq_1 = \mu scq_1$; Rejected

The null hypothesis is rejected due to a significant ($p<0.01$) difference between coaches and strength and conditioning coaches coaching qualifications.

Hypothesis 4: Ho = $\mu cq_2 = \mu scq_2$; Rejected

The null hypothesis has been rejected due there being a significant ($p<0.01$) difference between coaches and strength and coaches' academic qualifications.

Despite differences in education and experience, coaches are aware of, and have a relatively good understanding of, the demands of schoolboy rugby matches. They also seem to understand the importance of preparing their players for the specific needs and demands. However, they can be more equipped as coaches, by gaining more relevant qualifications to be able to ensure the preparation of the players is in line with research. One possible way of doing this is by having a better coach qualification system, which incorporates the demands and fundamentals surrounding the demands into the course syllabus.

Practical Implications & Future Research

While a coach's experience plays an important role in the understanding of the demands, they might require a variety of coaching tools to assist them in preparing their athletes. One such tool, could more rugby relevant qualifications. These qualifications would be supported by scientific evidence. This has the potential to educate and train both coaches and strength and conditioning coaches regarding the demands and proper preparation of the players. This preparation would be both for training purposes, as well as matches. The findings from this study could thus have the potential to diversify and change current coaching and training methods for the better.

- Improving the coaching qualifications that the coaches receive from the point of that they do not have the relevant match demand detail. Therefore, if the coach or coaches have completed a comprehensive coaching qualification which has the relevant scientific evidence related to match demands it would allow them to have a better understanding of the match demands. This better understanding therefore would allow for the better preparation for the players for the matches and ensure that there is more injury prevention occurring.

- There needs to be more emphasis placed on providing the younger coaches an opportunity of gaining qualifications. As it has been shown that experience is a key factor in coaching, therefore younger coaches need to be assisted as much as possible to gain more knowledge around the game to make up for the lack of experience.

- The BokSmart program needs to have a larger focus on coaches as only one of the 41 coaches stated that they had this qualification. As this program looks at injury prevention. It is vital that this program is made more available to all levels of coaches and strength and conditioning coaches.

There needs to be more emphasis placed on the up skilling of the caches through coaching workshops as well as coaching education days and or events. These events need to be made available for both government and private school coaches as costs of educational courses has the potential to make coaches avoid attending the courses. There needs to be more emphasis focused on coaches actually have the qualifications and not being allowed to coach without one, especially BokSmart.

Coaching course could be offered as extra mural activities at schools and or universities. There are school kids who are referring games and have gained that qualification while at school. I think this is probably the best way to get more people coaching qualified.

Normative data was perceived to be a coaching tool, that coaches would be very useful. The normative data can consist of aspects such as number of tackles a flank makes per game or how far a player runs per game. This data could allow them to alter training according to realistic match data.

Normative data could be added into a new, restructured coaching course, which would allow coaches to be more aware of player match demands of both adults and schoolboy rugby players. Therefore, the course could add to the coach's combination of academic qualifications and sound experience, creating an even better coach and potentially more team success.

For there to be normative data, further research into those areas needs to take place. The research areas that would need to be focused on to create the normative data are as follows:

- Player statistics: According to the author's knowledge, no South African published data on player statistics for school rugby players exists.

- Workload: There is workload data published on schoolboys in South Africa, which was found to be higher than other countries' workloads. There has been conflicting evidence to show that the methods of collecting the workload has faults, such as using sRPE, which does not include the effect that impacts and collisions has on workload. The use of various measures of subjective ratings, physiological responses and performance measures should be incorporated in the measurement of workload at a schoolboy rugby level in South Africa.

- GPS technology: Published GPS from schoolboy rugby players in South Africa, according to the author's knowledge, is very limited, if any exists. Therefore, to determine an actual understanding of what the players are faced with regards to physiological and physical demands during a match, more data must be collected in this area.

This future research will all allow for a better understanding of the demands of schoolboy ruby players within a South African context, which will assist with better athlete preparation and limiting injuries in the long run.

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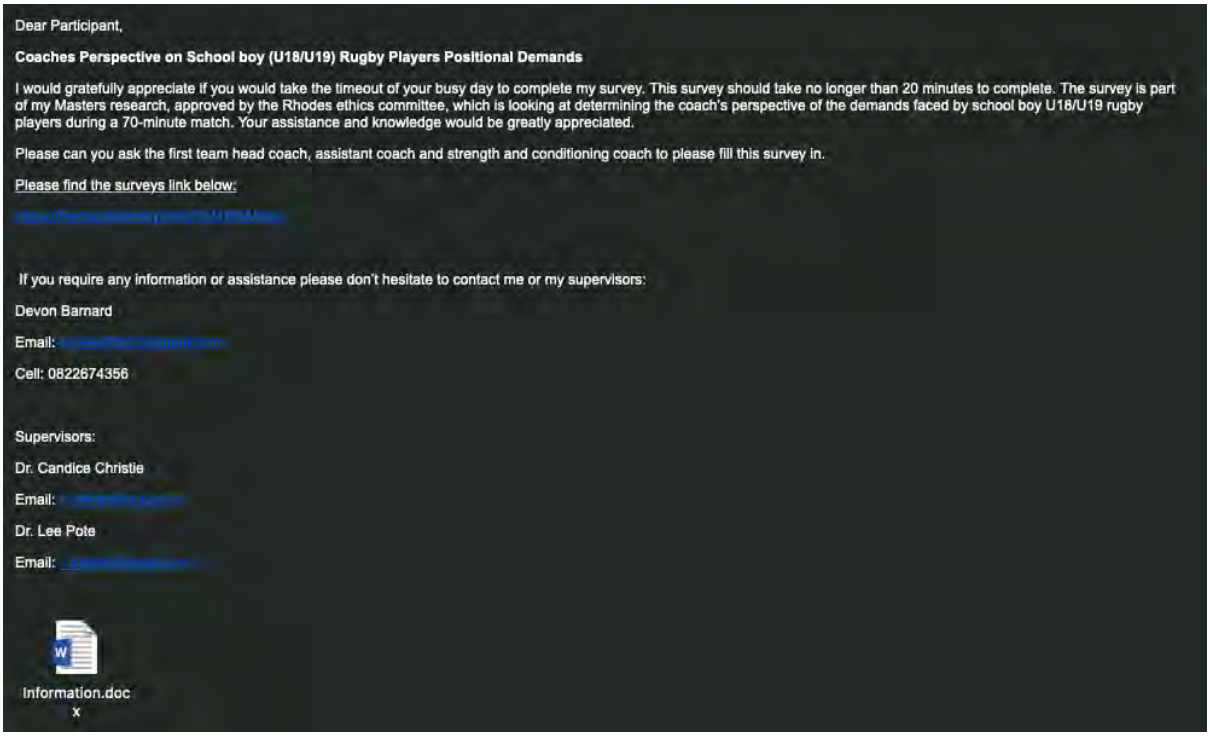
APPENDICIES

Appendix A – 2019 Top 100 Schools

RANK	TEAM	PLAYED	AVG BONUS POINTS
1	GREY COLLEGE	6	7.133
2	PAARL GIM	5	6.640
3	FRAMESBY	4	6.575
4	GREY HIGH SCHOOL	3	6.500
5	PAARL BOYS HIGH	3	6.431
6	HELPMEKAAR	4	5.600
7	GLENWOOD	6	5.483
8	ST ANDREWS COLLEGE	4	5.350
9	AFFIES	6	5.117
10	BISHOPS	4	4.733
11	MICHAELHOUSE	3	4.600
12	BOLAND LANDBOU	5	4.540
13	MONUMENT	6	4.483
14	SELBORNE COLLEGE	4	4.450
15	STELLENBERG	5	4.380
16	HILTON COLLEGE	6	4.350
17	DALE COLLEGE	4	4.300
18	EG JANSEN	4	3.950
19	ST STITHIANS	3	3.900
20	OUTENIQUA	3	3.700
21	WATERKLOOF	5	3.620
22	GARSFONTEIN	3	3.533
23	HEIDELBERG VOLKIES	3	3.450
24	WESTVILLE	5	3.220
25	MENLOPARK	4	3.218
26	QUEENS COLLEGE	4	3.075
27	JEPPE	3	3.033
28	HTS DROSTDY	5	2.960
29	MIDDELBURG HS	4	2.925
30	KINGSWOOD COLLEGE	3	2.867
31	UNION HS	5	2.840
32	DIE BRANDWAG	7	2.829
33	PAREL VALLEI	4	2.800
34	SACS	4	2.675
35	NORTHCLIFF	4	2.621
36	LIGBRON	6	2.610
37	JEUGLAND	7	2.514
38	ALBERTON HS	4	2.475
39	FICHARDTPARK	3	2.300
40	OOS MOOT	4	2.275
41	DESPATCH	7	2.229
42	WELKOM GYM	5	2.200
43	BEN VORSTER	5	2.112
44	SECUNDA	3	2.011
45	ST ALBANS COLLEGE	7	1.957
46	MARITZBURG COLLEGE	3	1.933
47	NORTHWOOD	3	1.910
48	DUINEVELD	5	1.900
49	JIM FOUCHE	4	1.800
50	ST DAVIDS	4	1.775
51	ST JOHNS COLLEGE	4	1.630
52	OAKDALE	3	1.621
53	HTS MIDDELBURG	4	1.575
54	MARLOW	4	1.500
55	LICHTENBURG	3	1.467
56	PIONIER	4	1.400
57	LOUIS BOTHA	3	1.167
58	HUGENOTE WELL	4	1.167
59	POTCH GIM	6	1.167
60	DIAMANTVELD	6	1.133
61	WITTEBERG	3	1.012
62	WORCESTER GYM	3	0.900
63	OTTO DU PLESSIS	5	0.840
64	CENTURION	4	0.725
65	MONTANA PTA	5	0.660
66	ERMELO	4	0.550
67	ST BENEDICTS	4	0.550
68	WESVALIA	3	0.533
69	LANGENHOVEN HS	3	0.533
70	MARAIS VILJOEN	4	0.525
71	BEN VILJOEN	5	0.400
72	OVERKRUIN	2	0.350
73	SENTRAAL	2	0.300
74	GOUDVELD	4	0.275
75	GRENS	3	0.267
76	NICO MALAN	5	0.180
77	KRUGERSDORP	3	0.167
78	ST CHARLES COLLEGE	3	-0.091
79	RANDPARK	3	-0.233
80	VOORTREKKER BETH	3	-0.267
81	PEARSON	5	-0.400
82	POTCH VOLKIES	5	-0.460
83	HERMANUS	3	-0.567
84	PIET POTGIETER	3	-0.633
85	GRAEME COLLEGE	4	-0.700
86	DURBANVILLE	3	-0.733
87	BEKKER	3	-0.767
88	WOODRIDGE COLLEGE	3	-0.933
89	STRAND	5	-0.980
90	CHARLIE HOFMEYR	3	-1.233
91	DHS	3	-1.367
92	ST ANDREWS SCHOOL	3	-1.400
93	PARKTOWN	4	-1.450
94	HUDSON PARK	5	-1.520
95	BRACKENFELL	4	-1.575
96	TRANSVALIA	4	-1.625
97	MUIR	3	-1.800
98	TYGERBERG	3	-1.900
99	ZWARTKOP	3	-3.100
100	STIRLING	3	-3.300

Appendix B - Email to Participants



Dear Participant,

Coaches Perspective on School boy (U18/U19) Rugby Players Positional Demands

I would gratefully appreciate if you would take the timeout of your busy day to complete my survey. This survey should take no longer than 20 minutes to complete. The survey is part of my Masters research, approved by the Rhodes ethics committee, which is looking at determining the coach's perspective of the demands faced by school boy U18/U19 rugby players during a 70-minute match. Your assistance and knowledge would be greatly appreciated.

Please can you ask the first team head coach, assistant coach and strength and conditioning coach to please fill this survey in.

Please find the surveys link below:

If you require any information or assistance please don't hesitate to contact me or my supervisors:

Devon Barnard

Email:

Cell: 0822674356

Supervisors:

Dr. Candice Christie

Email:

Dr. Lee Pote

Email:

Information.doc
x

Appendix C – Letter to Participants

HUMAN KINETICS & ERGONOMICS
Tel: +27 (0)46 6038471
Fax: +27 (0)46 6038934
Email: s.zschernack@ru.ac.za
j.mcdougall@ru.ac.za

Dear Participant,

I would gratefully appreciate if you would take the timeout of your busy day to complete my survey. This survey should take no longer than 20 minutes to complete. The survey is part of my Masters research, approved by the Rhodes ethics committee, which is looking at determining the coach's perspective of the demands faced by school boy U18/U19 rugby players during a 70-minute match. The research has been approved by the Your assistance and knowledge would be greatly appreciated.

Please find the surveys link below:

https://forms.gle/sm9q3KKVSM7MSMXs5

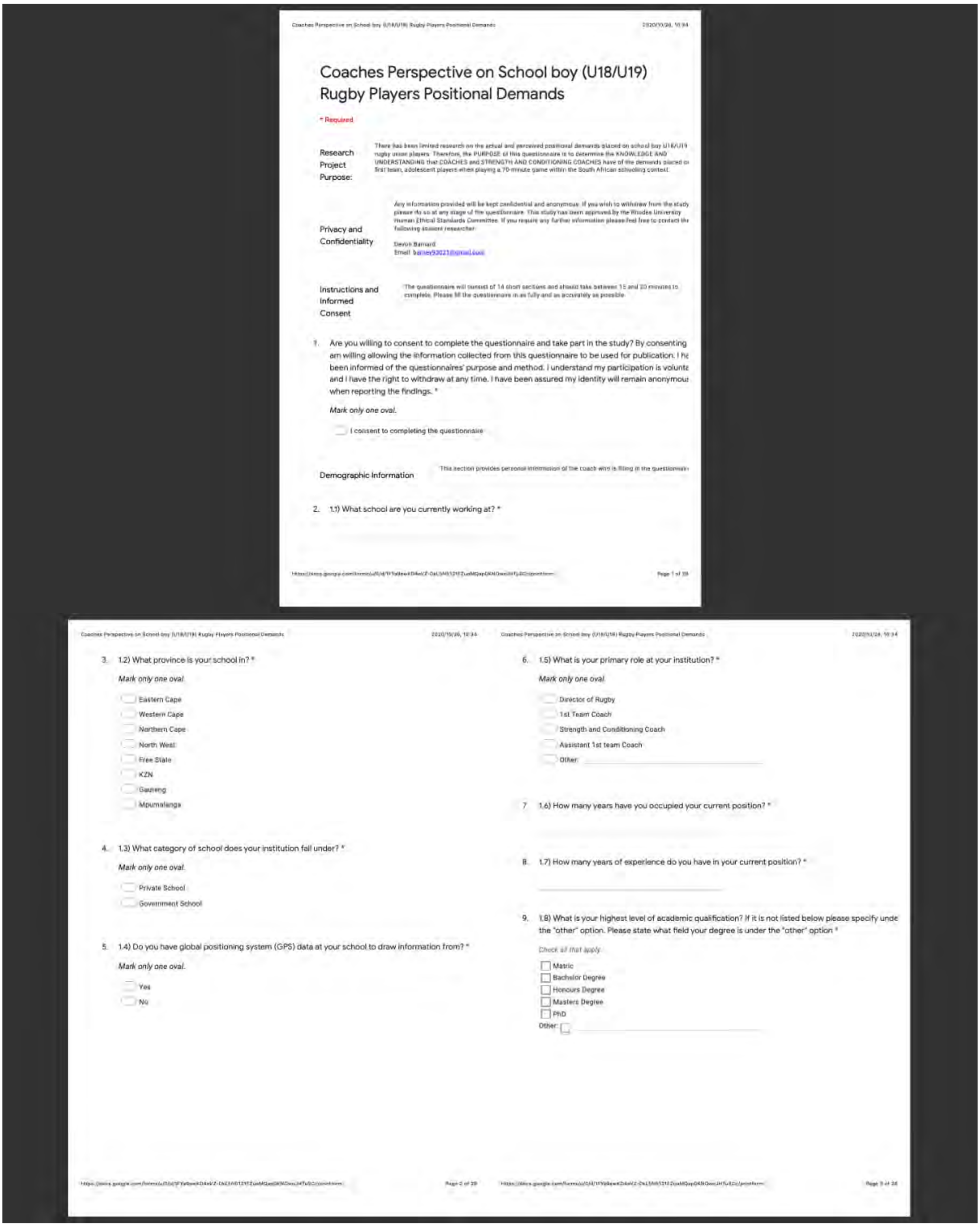
If you require any information or assistance please don't hesitate to contact me or my supervisors:

Devon Barnard
Email: barney93021@gmail.com
Cell: 0822674356

Supervisors:
Dr. Candice Christie
Email: c.christie@ru.ac.za

Dr. Lee Pote
Email: l.pote86@gmail.com

Appendix D - Questionnaire



Coaches Perspective on School boy (U18/U19) Rugby Players Positional Demands 2020/10/26, 10:34

Coaches Perspective on School boy (U18/U19) Rugby Players Positional Demands

* Required

Research Project Purpose: There has been limited research on the actual and perceived positional demands placed on school boy U18/U19 rugby union players. Therefore, the PURPOSE of this questionnaire is to determine the KNOWLEDGE AND UNDERSTANDING that COACHES and STRENGTH AND CONDITIONING COACHES have of the demands placed o[n] first team, adolescent players when playing a 70-minute game within the South African schooling context.

Privacy and Confidentiality: Any information provided will be kept confidential and anonymous. If you wish to withdraw from the study please do so at any stage of the questionnaire. This study has been approved by the Rhodes University Human Ethical Standards Committee. If you require any further information please feel free to contact the following student researcher:

Devon Barnard
Email: barney93021@gmail.com

Instructions and Informed Consent: The questionnaire will consist of 14 short sections and should take between 15 and 20 minutes to complete. Please fill the questionnaire in as fully and as accurately as possible.

1. Are you willing to consent to complete the questionnaire and take part in the study? By consenting am willing allowing the information collected from this questionnaire to be used for publication. I ha[ve] been informed of the questionnaires' purpose and method. I understand my participation is volunta[ry] and I have the right to withdraw at any time. I have been assured my identity will remain anonymous when reporting the findings. *

   Mark only one oval.

   - I consent to completing the questionnaire

Demographic Information: This section provides personal information of the coach who is filling in the questionnair[e]

2. 1.1) What school are you currently working at? *

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3. 1.2) What province is your school in? *

   Mark only one oval.

   - Eastern Cape
   - Western Cape
   - Northern Cape
   - North West
   - Free State
   - KZN
   - Gauteng
   - Mpumalanga

4. 1.3) What category of school does your institution fall under? *

   Mark only one oval.

   - Private School
   - Government School

5. 1.4) Do you have global positioning system (GPS) data at your school to draw information from? *

   Mark only one oval.

   - Yes
   - No

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6. 1.5) What is your primary role at your institution? *

   Mark only one oval.

   - Director of Rugby
   - 1st Team Coach
   - Strength and Conditioning Coach
   - Assistant 1st team Coach
   - Other:

7. 1.6) How many years have you occupied your current position? *

8. 1.7) How many years of experience do you have in your current position? *

9. 1.8) What is your highest level of academic qualification? If it is not listed below please specify unde[r] the "other" option. Please state what field your degree is under the "other" option *

   Check all that apply.

   - Matric
   - Bachelor Degree
   - Honours Degree
   - Masters Degree
   - PhD
   - Other:

Page 3 of 28

10. 1.9) What is your most relevant qualification to your position for either rugby coaching or strength and conditioning? If it is not listed below please specify under the "other" options. (Please note mc than one may be selected) *

Check all that apply

- [ ] Conditioning Qualification (NSCA,UKSCA etc.)
- [ ] World Rugby Coaching Level 1
- [ ] World Rugby Coaching Level 2
- [ ] World Rugby Coaching Level 3
- Other: [ ] ______

11. 1.10) Would you being willing to be contacted by the researcher for a short interview to allow him/I to gain more valuable information from you? (If yes, please leave your name and email address below, If no please comment no) *

______

Coaches Perspective

This section will determine the knowledge or perceptions you have of the positional demands placed on adolescent South African rugby union players

This section is specific to school boy U18/19 rugby union in the South African context

Anthropometric refers to the size of the players such as height and weight

12. 2.1) Please rank these school boy rugby demands in order from the most to the least (1 = most demanding and 5 = least demanding) *

Check all that apply

	1	2	3	4	5
Physical	☐	☐	☐	☐	☐
Physiological	☐	☐	☐	☐	☐
Biomechanical	☐	☐	☐	☐	☐
Mental	☐	☐	☐	☐	☐
Emotional	☐	☐	☐	☐	☐

13. 2.2) Do you think that the demands are different for different positions? *

Mark only one oval.

- ( ) Yes
- ( ) No

14. 2.3) Reason/s for your answer above? (Multiple may be chosen, if not listed please specify under "other") *

Check all that apply.

- [ ] Role in the team
- [ ] Size of the player
- [ ] Skill level of the player
- [ ] Game Plan/Game style
- [ ] Speed game
- [ ] Physicality of the game
- Other: [ ] ______

15. 2.4) Are the demands different between adolescents and adults? *

Mark only one oval.

- ( ) Yes
- ( ) No

16. 2.5) Reason/s for above answer? (Multiple may be chosen, if not listed please specify under "other

Check all that apply.

- [ ] Size of players
- [ ] Duration of the game
- [ ] Intensity of the game
- [ ] Skill level
- [ ] Coaching of players
- [ ] Speed of the game
- [ ] Physicality of the game
- Other: [ ] ______

17. 2.6) Do you believe/perceive the demands to be different between games played at the school bo provincial level (Craven Week) versus school level games? *

Mark only one oval.

- ( ) Yes
- ( ) No

18. 2.7) Reason/s for above answer? (Multiple may be chosen, if not listed please specify under "other

Check all that apply.

- [ ] Intensity of the game
- [ ] Size of the players
- [ ] Skill level
- [ ] Coaching of the players
- [ ] Speed of the game
- [ ] Physicality of the game
- Other: [ ] ______

19. 2.8) Do you think the statement of "South Africa being a forward dominant country" is true or false *

Mark only one oval.

- ( ) True
- ( ) False

20. 2.9) Do you think the statement that "South African coaches choose players based on anthropometric measure" is true or false? (Anthropometric refers to the size of players including height and weight) *

Mark only one oval.

- ( ) True
- ( ) False

21. 2.10) Rank in order of what backs do the most of during a game? (1 = least and 5 = most) *

Check all that apply.

	1	2	3	4	5
Stand still	☐	☐	☐	☐	☐
Walk	☐	☐	☐	☐	☐
Jog	☐	☐	☐	☐	☐
Run	☐	☐	☐	☐	☐
Sprint	☐	☐	☐	☐	☐

22. 2.11) Rank in order of what forwards do the most of during a game? (1 = least and 5 = most) *

Check all that apply.

	1	2	3	4	5
Stand still	☐	☐	☐	☐	☐
Walk	☐	☐	☐	☐	☐
Jog	☐	☐	☐	☐	☐
Run	☐	☐	☐	☐	☐
Sprint	☐	☐	☐	☐	☐

Player Statistics

The player statistics that are being referred to in this section relates to statistics such as tackle count, ruck count, pass count etc.

This section is specific to school boy U18/19 rugby union in the South African context

23. 3.1) Do you have player statistics for your teams' games? (The player statistics that are being referred to in this section relates to statistics such as tackle count, ruck count, pass count etc.) *

Mark only one oval.

- ( ) Yes
- ( ) No

24. 3.2) If you were to have player statistics would you use them for match analysis purposes? (The player statistics that are being referred to in this section relates to statistics such as tackle count, ruck count, pass count etc.) *

Mark only one oval.

- Yes
- No

25. 3.3) If research was done on this and the information was available on player statistics would you a a coach use this information? (The player statistics that are being referred to in this section relates to statistics such as tackle count, ruck count, pass count etc.) *

Mark only one oval.

- Yes
- No

26. 3.4) What would you as a coach or strength and conditioning coach use the player statistics for? (i not listed below please indicate it under the "other" option) *

Check all that apply.

- ☐ Training purposes
- ☐ Match tactics
- ☐ Match analysis
- Other: ☐

Movement Demands

This section relates to the amount of time that you believe players spend doing various tasks on the field during a game. Note that this section is time based (seconds) so least refers the least amount of time and most refers to the most amount of time. The work-to-rest ratio looks at the ratio of work and rest so the amount of time working on the field and the amount of time resting on the field. The contact situation is when the player/s are involved in physical contact with another players.

27. 4.1) Please rank the following positions in order from the highest work to rest ratio to the lowest w to rest ratio (1 = highest amount of work and least amount of rest and 10 = lowest amount of work and the highest amount of rest). The work-to-rest ratio looks at the ratio of work and rest so the amount of time working on the field and the amount of time resting on the field. (If you can't see t please scroll to the side it is there) (If you can't see ten please scroll to the side it is there) *

Check all that apply.

	1	2	3	4	5	6	7	8	9	10
Props	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hooker	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Locks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flanks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number 8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Scrumhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flyhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Centers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wings	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fullback	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

28. 4.2) Please rank the following positions in the order of which position/s has the most rest time. Res time is defined as not moving or being involved in any action that can contribute to the game (1 = most rest time and 10 = least amount of rest. (If you can't see ten please scroll to the side it is ther (If you can't see ten please scroll to the side it is there) *

Check all that apply.

	1	2	3	4	5	6	7	8	9	10
Props	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hooker	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Locks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flanks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number 8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Scrumhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flyhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Centers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wings	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fullback	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

29. 4.3) Which positional group spend the most time in contact situations? The contact situation is wh the player/s are involved in physical contact with another players. *

Mark only one oval.

- Forwards
- Backs

30. 4.4) Please rank the following positions in order of which position spends the most time in contact situations to which position spends the least amount of time in contact situations. (1 = most amou of time and 10 = least amount of time). The contact situation is when the player/s are involved in physical contact with another players. (If you can't see ten please scroll to the side it is there) *

Check all that apply.

	1	2	3	4	5	6	7	8	9	10
Props	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hooker	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Locks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flnaks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number 8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Scrumhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flyhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Centers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wings	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fullback	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

31. 4.5) Do you think there is a difference between adults and adolescents with regard to work to rest ratio? *

Mark only one oval.

- Yes
- No

32. 4.6) Please state the reason for the your above answer?

33. 4.7) Please rank the following positions in order of which position spends the most time walking around to which position spends the least amount of time walking (1 = most and 10 = least). Walkir defined as speeds between 0 and 1 km per hour. (If you can't see ten please scroll to the side it is there) *

Check all that apply.

	1	2	3	4	5	6	7	8	9	10
Props	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hooker	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Locks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flanks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number 8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Scrumhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flyhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Centers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wings	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fullback	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Coaches Perspective on School boy (U18/U19) Rugby Players Positional Demands 2020/10/26, 10:34

34. 4.8) Please rank the following positions in order of which position spends the most time jogging tc which position spends the least amount of time jogging (1 = most and 10 = least). Jogging is defin as speeds between 1 and 7 km per hour. (If you can't see ten please scroll to the side it is there) *

Check all that apply.

	1	2	3	4	5	6	7	8	9	10
Props	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hooker	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Locks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flanks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number 8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Scrumhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flyhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Centers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wings	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fullback	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Coaches Perspective on School boy (U18/U19) Rugby Players Positional Demands 2020/10/26, 10:34

35. 4.9) Please rank the following positions in order of which position spends the most time sprinting which position spends the least amount of time sprinting (1 = most and 10 = least). Sprinting is defined as speeds above 21km per hour. (If you can't see ten please scroll to the side it is there) *

Check all that apply.

	1	2	3	4	5	6	7	8	9	10
Props	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hooker	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Locks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flanks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number 8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Scrumhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flyhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Centers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wings	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fullback	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Movement Demands

This section is specific to school boy U18/19 rugby union in the South African context. This section relates to the amount of distance that is covered by different positions during a game.

36. 5.1) Which positional group covers on average the most distance during a game? *

Mark only one oval.

- ( ) Forwards
- ( ) Backs

Coaches Perspective on School boy (U18/U19) Rugby Players Positional Demands 2020/10/26, 10:34

37. 5.2) Please rank these positions in order of which position covers the most distance to which posi covers the least amount of distance during a game. (1 = most and 10 = least) (If you can't see ten please scroll to the side it is there) *

Check all that apply.

	1	2	3	4	5	6	7	8	9	10
Props	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hooker	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Locks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flanks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number 8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Scrumhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flyhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Centers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wings	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fullback	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

38. 5.3) Who covers on average the most distance during a game? *

Mark only one oval.

- ( ) Adults
- ( ) School boy U18/U19s

39. 5.4) What is the average distance covered by adults during a game? *

Mark only one oval.

- +/- 1000m
- +/- 2000m
- +/- 3000m
- +/- 4000m
- +/- 5000m
- +/- 6000m
- +/- 7000m
- +/- 8000m
- +/- 9000m
- +/- 10000m

40. 5.5) What is on average the distance covered by School boy U18s during a game? *

Mark only one oval.

- +/- 1000m
- +/- 2000m
- +/- 3000m
- +/- 4000m
- +/- 5000m
- +/- 6000m
- +/- 7000m
- +/- 8000m
- +/- 9000m
- +/- 10000

Movement Demands

This section is specific to school boy U18/19 rugby union in the South African context. High Intensity Efforts are those activities where the players are giving an all out effort and the heart rates are the highest during a game. So this includes sprinting which is an all out effort of running at maximal speed

41. 6.1) Which positional group at school boy rugby level has the highest top speed during a game? *

Mark only one oval.

- Forwards
- Backs

42. 6.2) Please rank within the forwards which position has the highest top speed to which position ha the lowest top speed. (1 = highest and 5 = lowest) *

Check all that apply.

	1	2	3	4	5
Props	☐	☐	☐	☐	☐
Hooker	☐	☐	☐	☐	☐
Locks	☐	☐	☐	☐	☐
Flanks	☐	☐	☐	☐	☐
Number 8	☐	☐	☐	☐	☐

43. 6.3) Please rank within the backs which position has the highest top speed to which position has tl lowest top speed. (1 = highest and 5 = lowest) *

Check all that apply.

	1	2	3	4	5
Scrumhalf	☐	☐	☐	☐	☐
Flyhalf	☐	☐	☐	☐	☐
Centers	☐	☐	☐	☐	☐
Wings	☐	☐	☐	☐	☐
Fullback	☐	☐	☐	☐	☐

44. 6.4) Who has on the highest top speed during a game? *

Mark only one oval.

- Adults
- School boy U18s

45. 6.5) Please rank from the highest average speed to the lowest average speed within the forwards = highest and 5 = lowest) *

Check all that apply.

	1	2	3	4	5
Props	☐	☐	☐	☐	☐
Hooker	☐	☐	☐	☐	☐
Locks	☐	☐	☐	☐	☐
Flanks	☐	☐	☐	☐	☐
Number 8	☐	☐	☐	☐	☐

46. 6.6) Please rank from the highest average speed to the lowest average speed within the backs (1 = highest and 5 = lowest) *

Check all that apply.

	1	2	3	4	5
Scrumhalf	☐	☐	☐	☐	☐
Flyhalf	☐	☐	☐	☐	☐
Centers	☐	☐	☐	☐	☐
Wings	☐	☐	☐	☐	☐
Fullback	☐	☐	☐	☐	☐

47. 6.7) Which school boy rugby positional group has on average the highest heart rate during a game (If you have global positioning system (GPS) data please use it to answer this, if you don't have GP data please give us your opinion) *

Mark only one oval.

- Forwards
- Backs

48. 6.8) Please rank from the highest average heart rate to the lowest average heart rate (1 = highest a 10 = lowest). (If you can't see ten please scroll to the side it is there) *

Check all that apply.

	1	2	3	4	5	6	7	8	9	10
Props	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hooker	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Locks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flanks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number 8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Scrumhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flyhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Centers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wings	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fullback	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Injuries

This section is specific to school boy U18/19 rugby union in the South African context. This section is related to injuries that the players are faced with as well as how often it occurs and what are the most common causes of injury. Please note that there are a few terms which might be confusing, please see definitions below:

Injury incidence rate: This refers to the amount of injuries that occur per 1000 practice and players hours.

Time loss injury: This is an injury that results in the player missing practices and matches, meaning he is not available for selection.

Medical injury: This is an injury that just requires the player/s see a medical practitioner and he is available for selection.

49. 7.1) Which school boy rugby (U18/U19) positional group has more time loss injuries? Time loss injury This is an injury that results in the player missing practices and matches, meaning he is not availab for selection. *

Mark only one oval.

- Forwards
- Backs

50. 7.2) Which school boy rugby (U18/U19) positional group has more medical injuries? Medical Injury: This is an injury that just requires the player/s see a medical practitioner and he is available for selection *

Mark only one oval.

- Forwards
- Backs

51. 7.3) What are the three most common school boy U18/U19 injuries? *

Check all that apply.

- Concussion
- Spinal cord injury
- Bone fracture
- Joint injury
- Ligament sprain
- Muscle strain
- Muscle cramp
- Tendon injury
- Bruise/Contusion
- Skin abrasion
- Laceration

52. 7.4) What are the three most common causes of injuries for school boy rugby players (U18/U19)? *

Check all that apply.

- Being tackled
- Being the tackler
- Side-step
- Slipping
- Rucking
- Scrummaging
- Jumping
- Landing
- Acceleration
- Deceleration

53. 7.5) Who has a higher injury incidence rate? Injury incidence rate refers to the amount of injuries tl occur per 1000 playing hours *

Mark only one oval.

- Adults
- Adolescents

60. 8.2) Please rank in order which position has the highest number of impacts during a game to whicl position has the lowest number of impacts during a game. (1 = highest and 10 = lowest). (If you car see ten please scroll to the side it is there) *

Check all that apply.

	1	2	3	4	5	6	7	8	9	10
Props	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hooker	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Locks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flanks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number 8	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Scrumhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flyhalf	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Centers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wings	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fullback	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Workload Management

This section is based on the amount of workload that players are exposed to, with workload being defined as the amount of work that a player/s have done during a game or training session. The process of calculating workload and monitoring it is called workload monitoring. Workload monitoring refers to a system that is in place to monitor the workload of the players to ensure that they aren't over training or under training. In this section there are terms used such as elite adolescent which refers to those who are playing provincial rugby matches and non-elite adolescents refers to those who are playing normal school boy rugby matches.

61. 9.1) Does your school use workload monitoring as a tool to potentially minimise injuries? *

Mark only one oval.

- Yes
- No

62. 9.2) Which positional group has the highest workload for adolescents? *

Mark only one oval.

- Forwards
- Backs

63. 9.3) Please justify your answer above? *

64. 9.4) Do you think there is a difference between the workload of adolescents in other countries anc our country (RSA)? *

Mark only one oval.

- Yes
- No

65. 9.5) Please justify your answer above? *

66. 9.6) Do you think there is a difference in the workload between elite adolescents and non-elite adolescents? *

Mark only one oval.

- Yes
- No

67. 9.7) Please justify your answer above? *

68. 9.8) Do you think that it is intensity or duration of a practice that affects a player's workload? *

Mark only one oval.

- Intensity
- Duration
- Contact situations
- All of the above

69. 9.9) If there was an easy cost-effective method to monitor workload would you use it? *

Mark only one oval.

- Yes
- Yes, I would like to be contacted about it
- No

Research and Conditioning

This section asks questions to the coach on whether or not they would want information regarding the demands of adolescent rugby players

Sub groups: refers to different positions within the positional group (Props or locks or flyhalf or centres etc.)

70. 10.1) Would this information (information regarding the demands adolescents face) be helpful in yo preparation for rugby season? *

Mark only one oval.

- Yes
- No

71. 10.2) If research was done and normative data was found for the above sections (different movement demand sections questioned previously) would you see the importance of it? *

Mark only one oval.

- Yes
- No

72. 10.3) Would you structure your pre-season around this relevant information? *

Mark only one oval.

- Yes
- No

73. 10.4) Do your players receive specific conditioning and programs for their specific positional requirements? *

Mark only one oval.

- Yes
- No

Coaches Perspective on School-boy (U18/U19) Rugby Players Positional Demands 2020/10/26, 10:34

66. 9.6) Do you think there is a difference in the workload between elite adolescents and non-elite adolescents? *

Mark only one oval.

- Yes
- No

67. 9.7) Please justify your answer above? *

68. 9.8) Do you think that it is intensity or duration of a practice that affects a player's workload? *

Mark only one oval.

- Intensity
- Duration
- Contact situations
- All of the above

69. 9.9) If there was an easy cost-effective method to monitor workload would you use it? *

Mark only one oval.

- Yes
- Yes, I would like to be contacted about it
- No

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Coaches Perspective on School-boy (U18/U19) Rugby Players Positional Demands 2020/10/26, 10:34

Research and Conditioning

This section asks questions to the coach on whether or not they would want information regarding the demands of adolescent rugby players

Sub groups: refers to different positions within the positional group (Props or locks or flyhalf or centres etc.)

70. 10.1) Would this information (information regarding the demands adolescents face) be helpful in yo preparation for rugby season? *

Mark only one oval.

- Yes
- No

71. 10.2) If research was done and normative data was found for the above sections (different movement demand sections questioned previously) would you see the importance of it? *

Mark only one oval.

- Yes
- No

72. 10.3) Would you structure your pre-season around this relevant information? *

Mark only one oval.

- Yes
- No

73. 10.4) Do your players receive specific conditioning and programs for their specific positional requirements? *

Mark only one oval.

- Yes
- No

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Appendix E – Rhodes Ethical Clearance

Human Ethics Sub-Committee
Rhodes University Ethical Standards Committee
PO Box 94, Makhanda, 6149 South Africa
Email: ethics-committee@ru.ac.za

www.ru.ac.za/research/research/ethics
NHREC Registration No. REC-241114-045

3rd November 2020

Mr Devon Barnard
Department of Human Kinetics and Ergonomics
Rhodes University

Review Reference: **Pote 20180823 "Injury risk profile of South African school boy rugby players"**

Dear Devon Barnard

Re: Extension to the above Project

This letter confirms that the above research proposal is renewed for a further calendar year with the **approval** the Rhodes University Ethical Standards Committee (RUESC) – Human Ethics (HE) sub-committee.

I request you to please note that an indication of why this permission was not sought earlier in February 2020 is requested for record purposes. Furthermore, an indication of when the research is likely to be concluded will be appreciated.

Please ensure that the Ethical Standards Committee is notified should any substantive change(s) be made, for whatever reason, during the continued research process. This includes changes in investigators. Please also ensure that a brief report is submitted to the Ethics Committee on completion of the research. The purpose of this report is to indicate whether the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the Ethical Standards Committee should be aware of.

Sincerely,

Prof Arthur Webb
Chair: Human Ethics sub-committee, RUSEC-HE

Appendix F – Provincial Ethical Clearance

Province of the
EASTERN CAPE
EDUCATION

CORPORATE PLANNING MONITORING POLICY AND RESEARCH COORDINATION
Steve Vukile Tshwete Complex • Zone 6 • Zwelitsha • Eastern Cape
Private Bag X0032 • Bhisho • 5605 • REPUBLIC OF SOUTH AFRICA
Tel: +27 (0)40 608 4537/4773 • Fax: +27 (0)86 742 4942 • Website: www.ecdoe.gov.za

Enquiries: B Pamla Email: babalwa.pamla@ecdoe.gov.za Date: 06 July 2020

Dr Lee Pote

Rhodes University

Department of Human Kinetics and Ergonomics

Upper African Street

Makhanda

6139

Dear Dr Pote

PERMISSION TO UNDERTAKE A POST DOCTORAL STUDY: INJURY RISK PROFILE OF SOUTH AFRICAN SCHOOL BOY RUGBY PLAYERS

1. Your application to conduct the above-mentioned research involving collection of injury information from schools of the Eastern Cape Department of Education (ECDoE) is hereby approved based on the following conditions:

    a. there will be no financial implications for the Department;

    b. institutions and respondents must not be identifiable in any way from the results of the investigation;

    c. no minors will participate;

    d. it is not going to interrupt educators' time and task;

    e. the research may not be conducted during official contact time;

    f. no physical contact with educators and learners, only virtual means of communication should be used and that should be arranged and agreed upon in writing with the Principal and the affected teacher/s;

    g. you present a copy of the written approval letter of the Eastern Cape Department of Education (ECDoE) to the Cluster and District Directors before any research is undertaken at any institutions within that particular district;

building blocks for growth

Ikamva eliqaqambileyo!

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE RESEARCH APPROVAL LETTER

Date:	**10 August 2020**
Validity of Research Approval:	**04 February 2020 – 30 September 2020** **2019/560**
Name of Researcher:	**Barnard DV**
Address of Researcher:	**17 ParkRoad**
	Grahamstown
Telephone Number:	
Email address:	**Barney93021@gmail.com**
Research Topic:	**Injury risk profile of South African School boy rugby players**
Type of qualification	**Master of Science**
Number and type of schools:	**All Secondary Schools**
District/s/HO	**15 Districts**

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

11/08/2020

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

1. *Letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.*

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE HEAD OF DEPARTMENT

Private Bag X9137, PIETERMARITZBURG, 3200
Anton Lembede Building, 247 Burger Street, Pietermaritzburg, 3201
Tel: 033 3921062 / 033-3921051
Email: Phindile.duma@kzndoe.gov.za
Buyi.ntuli@kzndoe.gov.za

Enquiries: Phindile Duma/Buyi Ntuli **Ref.**:2/4/8/7002

Mr DV Barnard
17 Park Road
GRAHAMSTOWN
EASTERN CAPE
6139

Dear Mr Barnard

PERMISSION TO CONDUCT RESEARCH IN THE KZN DoE INSTITUTIONS

Your application to conduct research entitled: **"INJURY RISK PROFILE OF SOUTH AFRICAN SCHOOL BOY RUGBY PLAYERS",** in the KwaZulu-Natal Department of Education Institutions has been approved. The conditions of the approval are as follows:

1. The researcher will make all the arrangements concerning the research and interviews.
2. The researcher must ensure that Educator and learning programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, Educators, Schools and Institutions are not identifiable in any way from the results of the research. 5. A copy of this letter is submitted to District Managers, Principals and Heads of Institutions where the Intended research and interviews are to be conducted.
6. The period of investigation is limited to the period from 14 September 2020 to 10 March 2023.
7. Your research and interviews will be limited to the schools you have proposed and approved by the Head of Department. Please note that Principals, Educators, Departmental Officials and Learners are under no obligation to participate or assist you in your investigation.
8. Should you wish to extend the period of your survey at the school(s), please contact Miss Phindile Duma/Mrs Buyi Ntuli at the contact numbers above.
9. Upon completion of the research, a brief summary of the findings, recommendations or a full report/dissertation/thesis must be submitted to the research office of the Department. Please address it to The Office of the HOD, Private Bag X9137, Pietermaritzburg, 3200.
10. Please note that your research and interviews will be limited to schools and institutions in KwaZulu-Natal Department of Education.

156 Barkly Road
Kimberley 8301

Private Bag X5029
Kimberley 8300
Republic of South Africa

Tel: 053 839 6500
Fax: 053 839 6580/1

DEPARTMENT OF EDUCATION

Enquiries: J.N.Horne
Reference: L2.10.2.4.3
Date: 5 November 2020

To: D. Barnard
17 Park Road
Grahamstown

Dear Mr. D. Barnard

APPROVAL IN RESPECT OF REQUEST TO CONDUCT RESEARCH

Your letter received pertaining to the aforesaid matter with our Ref: L2.10.2.4.3 bears reference.

This letter serves to indicate that approval is granted to your good self to conduct research for the dissertation titled: "**Injury risk profile of South African school boy rugby players**"

The onus rests with the researcher to organise appropriate and relevant time schedules with the school/s and educator/s involved in order to conduct the research. Copies of these approval letter must be presented to the school/s (Principal and SGB) and to the District Director as proof that permission for the research has been granted.

The following conditions must be strictly applied to conduct your research in the Northern Cape Department of Education. Approval may be withdrawn should any of the conditions listed below be flouted.

Criteria for approval	**Comment**
Value of the proposed research	The Research Topic covers a policy position of the Basic Education Sector and thus has value.
Policy and Strategic Alignment	The Research is aligned to Policy and to the Medium Term Strategic Framework as teacher development falls within the ambit of the Six Priorities of the Basic Education Sector.
Potential benefits to the NCDoE	The NCDoE would benefit from the research as empirical evidence would be available that is derived from the Northern Cape experiences.
Contribution to the knowledge base and literature in the Basic Education Sector	The Research Report findings will contribute to the knowledge base and literature of the Basic Education Sector after undergoing the necessary scrutiny for rigour and other tests.

Western Cape Government
Education

Directorate: Research

Audrey.wyngaard@westerncape.gov.za
tel: +27 021 467 9272
Fax: 0865902282
Private Bag x9114, Cape Town, 8000
wced.wcape.gov.za

REFERENCE: 20200720-7081
ENQUIRIES: Dr A T Wyngaard

Mr Devon Barnard
17 Park Road
Grahamtown
6139

Dear Mr Devon Barnard

RESEARCH PROPOSAL: INJURY RISK PROFILE OF SOUTH AFRICAN SCHOOL BOY RUGBY PLAYERS

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **27 July 2020 till 19 March 2021.**
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Dr A.T Wyngaard at the contact numbers above quoting the reference number?
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

    The Director: Research Services
    Western Cape Education Department
    Private Bag X9114
    CAPE TOWN
    8000

We wish you success in your research.

Kind regards.
Signed: Dr Audrey T Wyngaard
Directorate: Research
DATE: 21 July 2020

Enquiries: KK Motshumi
Ref: Research Permission: DV Barnard
Tel. 079 503 4943
Email: K.Mots[illegible]

education
Department of Education
FREE STATE PROVINCE

17 Park Road
Grahamstown
Eastern Cape
6139

Dear Mr. Barnard

APPROVAL TO CONDUCT RESEARCH IN THE FREE STATE DEPARTMENT OF EDUCATION

1. **Topic:** Injury risk profile of South African school boy rugby players.

   List of schools involved: Goudveld Secondary School in Lejweleputswa District

2. **Target Population:** First team Rugby coaches.

3. **Period of research:** From the second week of February 2021 until 30 September 2021. Please note that the department does not allow any research to be conducted during the fourth term (quarter) of the academic year. Should you fall behind your schedule by three months to complete your research project in the approved period, you will need to apply for an extension. The researcher is expected to request permission from the school principals to conduct research at schools

4. The approval is subject to the following conditions:

   4.1 The collection of data should not interfere with the normal tuition time or teaching process.

   4.2 A bound copy of the research document or a CD, should be submitted to the Free State Department of Education, Room 319, 3rd Floor, Old CNA Building, Charlotte Maxeke Street, Bloemfontein.

   4.3 You will be expected, on completion of your research study to make a presentation to the relevant stakeholders in the Department.

   4.4 The ethics documents must be adhered to in the discourse of your study in our department.

5. Please note that costs relating to all the conditions mentioned above are your own responsibility.

Yours sincerely

24/11/2020

DDG: Corporate Services
Mr. MM Sithole

DATE: