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Development of a Holistic Talent Identification Framework in youth Rugby Union

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DEVELOPMENT OF A HOLISTIC TALENT IDENTIFICATION FRAMEWORK IN YOUTH RUGBY UNION

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DECLARATION AND CONSENT

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Declaration:

Yr wyf drwy hyn yn datgan mai canlyniad fy ymchwil fy hun yw'r thesis hwn, ac eithrio lle nodir yn wahanol. Caiff ffynonellau eraill eu cydnabod gan droednodiadau yn rhoi cyfeiriadau eglur. Nid yw sylwedd y gwaith hwn wedi cael ei dderbyn o'r blaen ar gyfer unrhyw radd, ac nid yw'n cael ei gyflwyno ar yr un pryd mewn ymgeisiaeth am unrhyw radd oni bai ei fod, fel y cytunwyd gan y Brifysgol, am gymwysterau deuol cymeradwy.

I hereby declare that this thesis is the results of my own investigations, except where otherwise stated. All other sources are acknowledged by bibliographic references. This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree unless, as agreed by the University, for approved dual awards.

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Acknowledgements

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Thesis Abstract

Talent identification programmes are to identify talented players based on current observational performance attributes (Vaeyens et al., 2009). Coaches unlock the future potential of attaining professional contracts by honing talented players technical, tactical, and physical skills, (Till, et al, 2010; Parsonage et al, 2014; Höner, & Feichtinger, 2016). In particularly a greater focus goes towards older players, who exacerbates the physiological advantages of early maturation (i.e., greater height, weight, and physicality) which are desirable and important for successful game performance (Kelly et al., 2021). However, the recent emergence of the underdog hypothesis suggests that the negative impact of relative age and selection bias benefits younger players, as they develop superior psychological skills from the adverse environments (Gibbs et al., 2012; Kelly et al., 2021). Despite researchers presenting theories that psychological factors are the cause of younger players triumphs (Jones et al., 2018), there is little to no evidence to support the notion and the literature surrounding the psychological predictors of age grade rugby union is weak. With this in mind, this thesis aims to examine the pervasiveness of relative age in age grade rugby union whilst identifying the physiological and psychological differences between regional and club players in order to examine the psychological factors that may arise during the reversal of relative age.

This thesis is comprised of a general introduction, three experimental chapters and a general discussion. Chapter 1 investigates the physiological and psychological differences between regional and club rugby union players. Experimental chapter 2, builds on the findings of chapter 1, and aims to identify the predominance of relative age, and its repercussions between birth distributions in regards to physiological and psychological characteristics of regional and club players. Finally, experimental chapter 3 tracks the retained regional players over a season to examine the changes in physiological and psychological development in regards to relative age. A cross-sectional design was utilised for study 1 and 2 and a longitudinal approach for study 3. All examined data was collected at Rygbi Gogledd Cymru, regional age grade talent camps.

Experimental chapter 1 examines the physiological and psychological characteristics that differentiate regional and club players. Our physiological and anthropometric findings added to the

profound talent identification literature where regional players have greater anthropometric characteristics and a more robust physical abilities than club players. The psychological findings indicated unexpected differences where club players presented greater coping skills, and integrated motivation than regional players, however regional players are more optimistic and tend to strive for perfectionism more so than lower playing standards.

Experimental chapter 2 used the same data from study 1, players were categorised by birthdate and playing level. The aim of the study was to examine the existence of relative age effect and the physiological and psychological differences between playing level and age grade categories. There was an overrepresentation of older players compared to younger players in age grade rugby union, particularly within backs positions. Relatively older players were taller, heavier, and performed better in physical performance tests within the under 16s cohort. Whereas, in the elite under 18s relatively younger players showed more favourable psychological characteristics for performance such as, extraversion, openness to new experiences, emotional stability, and commitment to training than older elite under 18s players.

Experimental chapter 3 was a longitudinal study to track the development of anthropometric, physical, and psychological characteristics whilst considering the impact relative age has on the development of retained regional players aged between 16 and 18 years. The results consider the importance of balancing physical performance improvements with anthropometric development amongst age grade players as physical performance is a common outcome for anthropometric growth and development. Interestingly younger players develop more stable personality traits associated with successful career attainments than older players who were developing symptoms of athlete burnout. Findings offer a potential experimental explanation towards the reversal effect proposed by Jones et al., 2018.

Based on the findings presented in chapter 1-3 of the thesis, it provides a foundation for future research to further examine psychological differences between playing standards and their importance in regards to talent development. The implementation of coaches offering a psychological curriculum within a holistic talent development programmes can potentially develop psychological skills as well as the mental health of players which may lead to improved performances and well-being.

GENERAL INTRODUCTION

Talent Identification and Development

The development of rugby union came at a rapid pace towards the end of the nineteenth century (Collins, 2012; Duthie, Pyne & Hooper, 2003), with approximately 8.5 million registered players participating worldwide (i.e., 123 countries had registered rugby players in 2018; World Rugby, 2018). The increase in participation, professionalism, and development has led to more youth academy set ups, significant funding, and considerable attention in the literature (Hogan, & Norton, 2000) to work towards understanding the relationship between how talent is identified and developed (Nijs et al., 2014; Swann, Moran, & Piggott, 2014; Till & Baker, 2020). Governing bodies and unions have worked on developing high-performance programmes, which focuses on the long-term success of individuals who have demonstrated traits of potential elite performance (Vaeyens, et al., 2009; Till, et al, 2010; Parsonage et al, 2014; Höner, & Feichtinger, 2016). Crucially, the amount, and the quality of high-performance training and competition can influence the development of players in two ways; positively (i.e., signed to a single organisation post 18-years of age), and negatively (i.e., deselected or dropped out of the process) thus, it remains unclear of the ideal talent identification and development process for talented youths (Till, Barrel, Lawn, Lazenby, et al, 2020; Till, Weakley, Read, et al, 2020; Cupples, 2021).

Rugby union is considered a late specialisation sport (Phibbs, et al., 2018) and players are typically identified around 15-years of age from schools and local clubs (Robertson & Way, 2005; Till, Weakley, Read, et al, 2020). Often, identified players are invited to train at regional representational level, concurrently with their club and school rugby training, to further developed their technical, tactical, physical, psychological, and social skills (Parsonage et al, 2014; Till, Barrel, Lawn, Lazenby, et al, 2020). Within talent identification and development programmes the coaching, support systems and training styles becomes more specialised (Gabbett, 2006). There is a greater focus on competition and development, to ensure players are prepared for the demands of the professional game (Lloyd & Oliver, 2012).

A common problem with talent identification and development programmes is the low

predictive value and accuracy of talent identification and selection decisions (Baker et al., 2017). Talent identification and development programmes have been criticised for the impact subjective and bias opinions of coaches and scouts have on the talent identification process (Vaeyens, et al., 2008 Christensen, 2009; Johansson, & Fahlen, 2020). Thus, leading to a greater demand for clarity in talent identification requirements rather than assume current performances are associated with future success (Reilly, 1997; Nicholas, 1997; Cupples, 2021). Monitoring the development of players over a prolonged period can be beneficial towards contributing to the clarity and enhancement of talent identification and development programmes (Huigen et al., 2009; Till et al, 2013). A more in depth understanding of the individual during the talent identification process is required to prioritise the most effective method of optimal development and professional attainment (Baker et al., 2018).

The Demands of the Game

Research by Starkes and Ericsson (2003) identify four key domains that are needed to excel in rugby union, which include: physiological, technical, cognitive, and emotional (Gabbett, Jenkins & Abernethy, 2011). Rugby has become more physically demanding; with faster high-intense sprints and increased time in the contact area (Austin, Gabbett, & Jenkins, 2011., Eaves & Hughes, 2003) which requires players to have a highly developed physiological capacities of muscular strength, power, speed, and agility, (Baker, 2001., Baker & Newton, 2008). The technical and physical demands differ amongst positional units (i.e., forwards and backs), especially within age categories (Duthie et al., 2003; Côté et al., 2007; Darrall-Jones et al., 2015, 2016; Ashford et al., 2020) where a position specific fitness profiles is needed (James, Mellalieu, & Jones, 2005). Backs are involved in higher-intensity locomotor workload than forwards; travelling greater distances (e.g., covering distances of 30m and 60m in 4-6 seconds) with more frequent explosive outputs into open spaces, which results in greater time spent in the maximum heart rate zone (Duthie, Pyne, Marsh & Hooper, 2006; Cunniffe, Proctor, Baker & Davies, 2009). However, the total workload is greater amongst forwards (Docherty, Wenger & Neary, 1998) as forwards experience a greater number of collisions and physical contact (Cunniffe et al, 2009). Forwards have a greater power to mass ratio and are morphologically greater in height and body mass, to retain and gain possession of the ball (Nicholas, 1997). Forwards perform more static high intensity efforts than backs which illustrates the importance

for forwards to possess greater absolute strength, size, and mass to reduce the impact of collisions and set pieces (Roe et al, 2016; Quarrie, Hopkins, Anthony & Gill, 2013).

Whilst it is well established that there are several physical demands, research has also highlighted the psychological demands which include: tournament and match structure, extensive travelling, high training load, and the need to cope with the physicality of the sport (Kruyt, & Grobbelaar, 2019). Players are at constant risk of stress and may experience competitive anxiety induced by the risk of personal confrontation, injury, and performance errors (Neil et al., 2006; Nichols, Jones, Polman, & Borkoles, 2009). Sport psychologist have previously suggested that elevated stress levels predispose athlete burnout and injury (Hill & Appleton, 2001; Till Weakley, Road, 2020). Research by Cresswell & Eklund (2006) further confirmed burnout susceptibility amongst rugby players which indices poor concentration, flawed performance, and risk of dropout (Hodge, Lonsdale, & Ng., 2008). The high-performance demands coupled with high training loads increases players risks of developing mental health problems (Kruyt & Grobbelaar, 2019), previous research by Hill and colleagues (2015) have previously identified that developing adolescents show signs of struggling with the increased expectations associated with athletic development (Cupples, 2021). Therefore, individuals coping strategies are important in talent identification and development programmes, to monitor their progression and well-being within the system.

Physical Determinants of Selection

Rugby union and rugby league have undertaken decades of research that introduced the distinct anthropometric and physical performance differences across playing levels (Duthie, Pyne, & Hooper, 2003; Spamer & Hattingh, 2004; Smart, Hopkins, & Nicholas, 2013; Darrall-Jones, Jones, & Till, 2016; Jones et al., 2018), and benchmarking expectations as players progress through the pathway (Spamer, 2000; Till, et al., 2011; Argus et al., 2012; Till, et al., 2012; Darrall-Jones, Jones, & Till, 2015; Read, et al., 2017; Till, Scantlebury, & Jones, 2017; Jones, et al., 2018; Casserly et al., 2019; Owen et al., 2020). The performance differences highlight important information for coaches during identifying talent (Jones et al., 2018) as there are specific physical characteristics which are commonly associated with successful professional attainment (Gabbett, Kelly, & Pezet, 2007; Duthie, Pyne & Hooper, 2003; Olds, 2001; Quarrie & Wilson, 2000; Quarrie, Handcock, Toomey, & Waller,

84 1996).

85 In regards to differences between playing standards in rugby union, higher level of play is
86 associated with the characteristics of players being heavier, faster, and more aerobically fit than lower
87 playing standards (Quarrier et al., 1995). More specifically for the purpose of this study, regional age
88 grade representatives have previously shown to have superior height, body mass and strength, greater
89 speed across 10m and 40m, momentum, and agility than club (i.e., schoolboys) players according to
90 Jones and colleagues (2018). A greater size and mass suggest a selection advantage for higher playing
91 standards in age grade rugby (Till, Scantlebury, & Jones, 2017) and international level (Barr et al.,
92 2014; Fontana et al., 2017) because a greater stature and mass offer a performance advantage due to
93 the physical nature of rugby (Sedeaud et al., 2012; Till, Scantlebury, & Jones, 2017). Players are
94 required to physically dominate their opponent in the contact area to maintain and gain possession
95 which is easier when you are larger than your opponent (Duthie, Pyne, & Hooper 2003; Jones et al.,
96 2015). Therefore, coaches try to identify and select players who are naturally physically bigger to
97 place them on strength and conditioning development programmes to further increase size and
98 strength (Jones et al., 2018).

99 Physical size and strength are predominant qualities important for talent identification due to the
100 contact and collision element of rugby union (Till, Scantlebury, & Jones, 2017). Research is scarce
101 when comparing strength performance between playing standards but is it widely recognised that
102 strength is an advantage for rugby performance and future career attainment (Till, Jones & Geeson-
103 Brown, 2016; Till, Scantlebury, & Jones, 2017). Vaz, and colleges (2019) reported that players
104 selected for regional age grade representation have greater grip strength scores than non-selected
105 players in the under 19s. Strength training is associated with greater speed and power performance
106 (Duthie, Pyne, & Hooper, 2003) which are listed as important physical characteristic for rugby union
107 as strength and power improves a player's ability to sprint into open space, maintain possession and
108 make successful tackle breaks (Gabbett, Jenkins, & Abernethy, 2010; Vaz, et al., 2019). Players who
109 perform more optimally (i.e., significantly faster) are more likely to be found performing at higher
110 playing levels (Gabbett et al., 2009). Sprint velocity, body mass, momentum and power have
111 previously been successful in discriminating between playing levels (Baker & Newton, 2008; Jones et

al., 2018) because of their relationship with tackle ability and successful ball carries in players between 15-17 years of age (Gabbett, Jenkins, & Abernethy, 2010). Greater momentum results in a more rapid force production which is crucial for contact situations therefore a desirable characteristics during selection (Barr et al, 2014; Chiwaridzo, Ferguson & Smits-Engelsman, 2019).

Whilst there are specific differences between performance and playing standards, there are also specific performance attributes associated with positions and their match demands (Owen et al., 2020). Forwards are generally associated withgreater mass and stature, (Duthie, et al., 2003; Darrall-Jones, Jones & Till, 2015; Fontana et al, 2017; Weakley et al, 2019) muscular strength, (Durandt et al, 2006) greater sprint momentum and power (Ball, Halaki, Sharp, & Orr, 2018) as they help to dominate rucks, mauls, and lineouts to win and maintain ball possession (Duthie, et al., 2006). Whereas backs have the necessities for speed, acceleration, and agility (Darrall-Jones, Jones & Till, 2016; Lombard et al, 2015; Casserly, Neville & Grainger, 2019). Due to backs smaller stature and mass their ability to beat the opposition in open play is increased (Quarrie et al., 1996; Duthie, Pyne, & Hooper, 2003; Smart, Hopkins, & Nicholas, 2013; Darrall-Jones, Jones, & Till, 2016). Physical attributes and performance characteristics can influence the coach's decision of where a players strengths lie, to develop the player to their full potential (Owen, et al., 2020).

The physical characteristics of elite players form the basis of talent development training interventions (Smart, 2011). New structured training programmes (Till et al., 2015) reinforce performance changes substantially more at younger age categories (i.e., Under 16-17s). For example, muscular strength becomes more prevalent as players mature, begin resistance training, and increase training age (Weakley et al., 2019). Training age results in greater annual improvements in younger age categories because of increases in neuromuscular adaptions, however, the acceleration of development decreases with age and training experience (Faigenbaum, et al, 2009). For example, the progression in sprint performance (Gabbett, 2009; Till, et al., 2014; Darrall-Jones et al., 2015; Howard, Cumming, Atkinson, & Malina, 2016; Owen et al., 2020) and jump height (Darrall-Jones, et al., 2016; Kobal, et al., 2016; Fontana, et al., 2017; Weakley, et al., 2019) plateaus between 16 and 20 years of age. Therefore, it is important to monitor the anthropometric and physical development of players over a longitudinal period (Till, et al., 2014; Baker, & Newton., 2008).

Psychological Determinants of Selection

MacNamara et al (2010a, 2010b) early work, highlight the role of psychological factors and training behaviours in facilitating the pathway to elite performance. Several studies have identified psychological variables that are associated with elite performance (Ericsson & Charness, 1994; Morris, 2000; Durand-Bush & Salmela, 2002; Abbott, & Collins, 2004; MacNamara, & Collins, 2015). Psychological variables associated with successful elite players include the following: higher levels of emotional stability, coping strategies, perfectionism, optimism, extraversion, conscientiousness, agreeableness, discipline, self-confidence, and resilience; each listed psychological variable have been linked with higher levels of coachability, optimal performance and success in sport (Butt, 1987; Costa & McCrae; Cox, 1996; Saint-Phard et al., 1999; Connor-Smith & Flachsbart, 2007; Allen et al., 2013; Weinberg & Gould, 2015; Woodman & Roberts, 2015; Rees et al., 2016; Steca, et al., 2018; Kruger, Plooy, & Kruger, 2019; Wilmot & Ones, 2019; Steinbrink, Berger, & Kuckertz, 2020: See these authors for further details). Furthermore, there is evidence that support the premise that psychological characteristics can facilitate and also derail the talent identification and development process (MacNamara, & Collins, 2015). Research suggests that there are factors which are associated with overcoming the challenges of long-term development (e.g., motivation, self-regulation, and coping processes) to reach full potential as an athlete (Orlick & Partington, 1988; Hill, MacNamara & Collins, 2015; Gledhill et al., 2017) and there are dysfunctional dispositions (e.g., obsessive passion, adaptive perfectionism, dispositional optimism) which can negatively impact progression (Grove & Heard, 1998; Vallerand et al., 2003; Stoeber, Uphill, & Hotham, 2009; Höner & Feichtinger, 2016). For example, Höner and Feichtinger (2016) found a relationship between goal orientation and future success. The ability to set realistic performance goals help facilitate skill acquisition and self-evaluation which encourages individuals to remain on the player performance pathway, as it enables them to stay driven towards achieving and acquiring the most from training sessions (Gould et al, 1999; Durand-Bush & Salmela, 2002; Abbott & Collins, 2004). Whereas perfectionism has been recognised to potentially derail both the development and performance of an individual because of its potential maladaptive effects (i.e., commitment to exceedingly high standards and evaluative concerns; Hewitt & Flett, 1991; Hill & Appleton, 2001; Hill, MacNamara, &

Collins, 2015). Over-committed athletes have an unhealthy need for continuous approval and recognition and end-up working harder than necessarily required (Hill, MacNamara & Collins, 2015). Such effort is associated with athlete burnout which can lead to sport withdrawal (Hill & Appleton, 2011; Hetland et al, 2012). Positive characteristics that are inappropriately applied can lead to poor development, poor social and occupational performance (Till Weakley, Road, 2020) thus discriminating between players who remain and withdraw from the pathway (Collins & MacNamara, 2012). Therefore**,** it is considered important for coaches to know and understand the players psychological profiles. Previous research has argued the case for psychological and personality profiling to become a part of talent development (MacNamara, et al., 2010; Rees, et al., 2016) because it can potentially be of aid to coaches perception of an ideal player (Oliver et al., 2010; Cupples & O'Connor, 2011; Hill et al., 2015; MacNamara & Collins, 2015). Players who express greater levels of self-discipline, resilience, confidence, and emotional intelligence have previously been identified as desirable for the talent development pathway (Collins & MacNamara, 2012). Psychological profiling holds the potential to obtain insights on individual's coachability, well-being and work ethic (Piedmont, Hill & Blanco, 1999; Favor, 2011).

Assessments of psychological determinants of rugby union and their relationship with performance and development, have not been researched in depth, whereas research into the role of physiological and performance development is considered integral part of the player progression to identify whether training programmes are benefiting the players (Till et al., 2015). Research in psychological determinants of players development can offer a potential insight towards future performance outcomes and derailment (Dowdney, 2010). For example, the psychological characteristics of developing excellence (PCDE; MacNamara & Collins, 2011) questionnaire examines psychological characteristics that are developed over-time in the pathway as players progress and adapt to the changing demands of talent development (Cupples, 2021). The PCDE is promoted as a tool to monitor and evaluate players psychological development and further identifies players ability to cope with pressures within the pathway (Saward et al., 2020). Tracking players psychological response to the talent development system is important to ensure optimal development as well as protecting athlete wellbeing.

Relative Age Effect

Identifying talent during adolescent years can provides some difficulty for coaches and scouts as the rate of growth and maturation varies amongst individuals and can have a significant impact on sporting performance and selection (Fernley, 2012). The difference in age within selection age groups is referred to as relative age and its repercussion is recognised as the relative age effect (Kearney, 2017). The consequences of relative age effect are when players born earlier (i.e., born in first quarter of the year) in the selection year are favoured over those born later (i.e., born in the last quarter of the year; Grondin et al.,1984; Ek et al, 2020). This is due to a selection bias (Jones et al., 2018; Kelly et al, 2021) where players born closer to the start of the selection year have an increase likelihood of being overrepresented within talent identification and development programmes in contrast to players born nearer to the end (Cobley, Baker, Wattie, & Mckenna, 2009). Older players have been overrepresented in numerous sports such as: tennis (Edgar & O'Donoghue, 2005), ice hockey (Grondin et al, 1984), handball (Schorer, Wattie, & Baker, 2013), track and field (Brazo-Saya-vera et al, 2018), rugby union (Till et al. 2010; Lewis, Morgan, & Cooper, 2015) and soccer (Simmons & Paull, 2001; Zuber, Zibung, & Conzelmann, 2016; Johnson et al., 2017). Whether in a sport or school setting, there will be a greater number of older individuals who have physical advantages in athletic and academic endeavours than younger individuals (Maddux, Stacy & Scott, 1981; Grondin et al., 1984; Wilson, 1999; Petrez- Gonzalez et al., 2020).

Relative age in male rugby union has been reported in Australia (Fernley, 2012), France (Delorme, Boiché, & Raspaud, 2009), New Zealand (Simons & Adams, 2017), and South Africa (Grobler, Shaw, & Coopoo, 2016). Lewis, Morgan, and Cooper (2016) revealed a consistent relative age effect in rugby across all age categories and district teams in Wales from Under 7s to Under 19s (e.g., Quartile 1 = 29% vs. Quartile 4 = 22%). The findings also revealed a predominant relative age effect at regional and national level where representative selection occurs (e.g., Quartile 1 = 44% vs. Quartile 4 = 12%). In circumstances where competition for a place in a team is popular, relative age effect is more obvious (Grondin, et al., 1984; Musch & Grondin, 2001; Derorme, et al., 2009). Researchers believe sports that require more physicality (i.e., contact) are more vulnerable to relative age effect than non-contact sports (Baxter-Jones, 1995; Lames, & Werninger, 2012; Kelly et al.,

2021). A one-year age gap can affect physical, performance and psychological differences to a large extent and rugby union exacerbates the physiological advantages of players who are relatively older (Kelly, et al., 2021) thus leading to potential repercussions where younger players potentially turn away for the sport due to the lack of opportunities (Delorme, et al., 2009; Figueiredo et al.2019; Ek, et al., 2020; Doncaster, Medina, Drobnic, Gómez-Díaz, & Unnithan, 2020; Rubajczyk & Rokita, 2020). Kelly and colleagues (2021) and Baker et al (2009) support the notion that relative age effect in rugby occurs due to the physical nature of the game, specifically the rules and regulations (e.g., tackling, line out lifts, force in scrummaging, running, and grounding the ball).

A potential reversing of relative age effect has been identified by McCarthy and colleagues (2016) study on the reversal effect of relative age. A greater proportion of younger players have been reported to attain professional status (e.g., Quartile 1 = 20% vs. Quartile 4 = 50%) due to latency effects of early selection. The effects of relative age effect tapers towards adulthood (Lames, & Werninger, 2012) suggesting although relative age, effects selection decisions at an earlier age, it does not significantly affect the likelihood of attaining a professional contract (see further details in Chapter 2). Jones and colleagues (2018) believe the reversal effect occurs due to a psychological advantage amongst younger players from overcoming adversity of training and competing against older and more mature players. The reversal effect will be explored in more depth in experimental chapter 2 and 3 as there is no direct evidence for psychological factors being the cause of this reversal in relative age effect.

Considerations to Study Designs in Talent Identification and Development Research

Many talent identification and development studies adopt a cross-sectional design which assess performance at one-off time points (Leyhr et al., 2018). This snapshot approach can have large participation numbers which gather data on current performance characteristics (Baker, Schorer & Wattie, 2018; Vaeyens, et al., 2008) and can be provide valuable information to coaches regarding differences in characteristics between playing standards and its relation to talent (Morris, 2000; Vaeyens, Lenoir, Williams & Philippaerts, 2008; Till, Baker, 2020). Selection decisions based on one off assessments assume that talent is a fixed capacity. A fixed capacity is considered a limitation as it

is assumed players will not change over time (Baker et al, 2018; Till, Baker, 2020). Growth, development, and training cause a non-linear development in selection determinants (Forsman et al., 2016), because chronological age and maturation rarely progress at the same rate (Matthys, Vaeyens & Fransen, 2013; Diamond, 1983). The non-linear dynamic development (Baker, Wattie, & Schorer, 2018) of older individuals is considered to be an advantage during performance tests (Armstrong, et al., 1998; Lewis, Morgan, & Cooper, 2015), especially when long-term predictions are based on one observation (Abbott, & Collins, 2002).

Having established that cross-sectional studies have a large sample size, provide insights into current performance characteristics, and are an economic design, they are still considered important to utilise (Vaeyens, et al., 2008), however, it is imperative to consider the duration of talent identification and development programmes, in regards to predicting future success (Abbot & Collins, 2002). Monitoring the development of players over a prolonged period contributes to a greater understanding of the talent identification and development process (Huigen et al., 2009; Till et al, 2013). Longitudinal designs, help avoid biases as the participation sample is an already talented sample. The downfall of longitudinal studies is that they are time and energy consuming with usually small participant samples due to the high tendencies of dropout during the process (Johnston, Wattie, Schorer, & Baker, 2018). Therefore, in this thesis, both designs will be utilised; in the first chapters a cross-sectional approach will be used to identify the current physiological and psychological characteristics that differentiate regional and club age grade players, and the effect relative age effect has on selection parameters. The final chapter will be a longitudinal study covering the players development and the impact relative age has on their physiological and psychological development.

There is an overrepresentation of studies examining only the physical and performance profiles of athletes in talent identification and development systems, leading to an underrepresentation of multidimensional, holistic designs particularly in rugby union (Johnston, Wattie, Schorer, & Baker, 2018; MacNamara, et al., 2010). Identifying future success is becoming increasingly more difficult due to the rate sport is evolving and advancing (Robertson, 2021) and the complicated relationship between relative age and achieving expertise (Kelly, et al., 2021). Multidimensional and holistic approaches to talent identification offer a greater perspective to optimises the chances of identifying

key variables in potential athletes, as they encompass the anthropometry, physical performance, and psychological factors of the individual (Abbott & Collins, 2004; Vaeyens, et al., 2008; Hendricks, 2012; Robertson, 2021). Research into these key areas will aid the understanding of the differentiation between standards of play in age grade rugby union in regards to physiological and psychological characteristics. The inclusion of psychological factors is necessary, as research is scarce surrounding how psychological factors influence long-term development (Rees, et al., 2016) especially surrounding the reversal effect (Jones, et al., 2018). Therefore, the aims of this project are to:

(i) Identify the physiological and psychological differences between regional and club age-grade rugby union players.

(ii) Identify whether relative age effect exists in both regional and club rugby union in North Wales

(iii) Identify if there is a relative age effect on the physiological and psychological factors between regional and club players.

(iv) Finally, examine the longitudinal change in physiological and psychological factors across a season.

For the purpose of this study, players are classified into three groups: regional, club and elite. Regional players were representatives of 1 of the 5 rugby regions in Wales who compete in national competitive fixtures, and they were represented by the regional under 16s or under 18s squads and received specialised training. Club players were trained within North Wales community clubs, schools, and colleges. Elite under 18s were selected from the regional under 18 player pool and received additional conditioning and skills training via an educational academy pathway.

EXPERIMENTAL CHAPTER 1:

The physiological and psychological differences between male regional and club age grade rugby union players.

Abstract

Talent identification predominantly focuses on performance and physical attributes of talented youths, but research recognises that psychological factors are the key determinants for long-term success and development in the player performance pathway (Van Yperen, 2009; Hill, MacNamara, & Collins, 2015; Rees, et al., 2016; Dunn, et al., 2019). Being able to identify the psychological difference between regional and club players is an initial step towards identifying the psychological factors that are important for age grade success in rugby union. The aim of this study was to examine the physiological and psychological differences of 259 age grade players by age category and playing standard (i.e., Under 16 age: 15.0 ± 0.4 years, range 14.7 -17.0 years; Under 18 age: 16.5 ± 0.6 years, range 15.01 – 18.0 years; Elite Under 18s age: 16.8 ± 0.6 years, range 15.11-17.5 years). Players anthropometric, physical performance and psychological factors were measured at talent camps, and the findings suggested regional players were taller (p-value range = 0.004-0.045), heavier (p-value range p = 0.005-0.029), faster (p-value range = 0.002-0.010), stronger (p-value range = 0.002-0.043), with greater momentum (p-value range = 0.00-0.027), and power (p-value range = 0.000-0.026) than club players. Additionally, regional players scored higher in perfectionistic strivings (p-value range = 0.007-0.029), achievement motivation (p-value range = 0.040-0.041) and optimism (p-value range = 0.018-0.019). However, club players do present more optimal coping skills (p-value range = 0.004-0.040), and integrated motivation (p-value range = 0.010) than regional players. In conclusion, talent development systems should consider monitoring psychological factors as there are differences between standards of play.

Introduction

Talent identification programmes aim to identify and develop healthy, capable, and resilient players for professional career attainment (Till, et al., 2020, Welsh Rugby Union, Ltd., 2020). Development programmes are controlled by governing bodies to ensure players are exposed to a developmentally appropriate and player centred environment (Robertson & Way, 2005). Whilst the talent identification and development programmes are useful to develop athletes a common problem is that current performance standards of talented youths are used to identify and predict future performances and success in adulthood (Baker, Schorer & Wattie, 2018; Vaeyens, Lenoir, Williams & Philippaerts, 2008). Talent identification and development programmes do not account for all attributes, focusing solely on identifying individuals with physical potential without consideration for mental aspects and psychological characteristics (Twist & Hutton, 2007). Predicting future performance and player potential is considered difficult, as decisions are based on current performances which result in bias decisions during the selection process (Baker, Schorer, & Wattie, 2018; Till & Baker, 2020).

Talent identification if often based on anthropometric, physical performance, and competition parameters which is used to form the basis of talent development (Guillch & Cobley, 2017). The physical and performance parameters are associated with the physical demands of rugby union and players are required to have highly developed physical qualities (Darrel-Jones, Jones & Till, 2016). Studies have highlighted that players who are taller (Williams & Reilly, 2000), heavier (Patton, McIntosh & Denny, 2016), faster (Gabbett et al., 2011 & Gabbett, Comerford, & Stanton, 2014), have greater strength (Vaz, Batista, Honorio & fernandes, 2019) and generate more power (Vaeyens et al., 2006; Duthie, Pyne, Marsh & Hooper, 2006; Chiwaridzo et al, 2019) are likelier to be found on a talent identification and development programme (Barker et al., 1993; Williams & Reilly, 2000; Vaeyens et al., 2006, Gabbett et al., 2011; Gabbett, Comerford, & Stanton, 2014; Baker, 2017; Chiwaridzo et al, 2019) because players with highly developed physical qualities are considered superior, particularly during under 16s selection (McCormack, Jones, & Till, 2020; Till, Scantlebury & Jones, 2017; Gabbett, Jenkins & Abernethy, 2010). Additionally, highly developed physical qualities increase the likelihood of under 18s players achieving professional status (Till, Jones &

Geeson-Brown, 2016).

Regardless of the predominant talent identification focus on performance and physical characteristics there is evidence that recognises psychological factors as being key determinants for long-term success (Van Yperen, 2009; Hill, MacNamara, & Collins, 2015; Rees, et al., 2016; Dunn, et al., 2019). As early as the 1970s, researchers have attempted to identify the psychological characteristics of elite performance, emphasising that they contribute to 50% of the variance in progressing effectively within talent development (Kunst, & Florencu, 1971; Mahanoey & Avener, 1977). Psychological "success factors" distinguish successful athletes from their less successful counterparts and have been mentioned previously by numerous studies (Orlick & Partington, 1998; Gould, Diffenbach, & Moffett, 2002; Durand-Bush & Salmela, 2002; Baker & Côté, 2003; Hill, MacNamara & Collins, 2015). MacNamara, Button & Collins (2010) highlighted the importance of psychological skills to facilitate athlete development. The 'Psychological Characteristics of Developing Excellence' (PCDEs) questionnaire by MacNamara, Button, and Collins (2010) identifies the psychological skills associated with talent development and long-term success (i.e., competitiveness and motivation, commitment, goal setting, importance of working on weaknesses, coping under pressure and self-belief). More recently, the 'The Great British Medallist Study' (GBM) presented evidence of psychological factors and personality traits related to successful elite and super elite athletes (Rees, et al., 2016). The GBM review provided evidence that more successful athletes display higher levels of the following: motivation, confidence, perceived control, mental toughness, resilience, coping skills, greater resistance to choking under pressure and possess a wider range of mental skills (e.g., goal setting, anxiety control, imagery, self-talk, and decision-making), greater conscientiousness, dispositional optimism, adaptive perfectionism, and hope. Following-up on the GBM study the 'Athlete Development Formulation Survey' (ADFS) (Dunn et al., 2019) designed a practical athlete friendly questionnaire which taps into a multitude of psychological factors that have previously been found to influence elite performance. The questionnaire used for this study is primarily based off the early iterations of the ADFS (i.e., goal orientation, commitment, perfectionism). Additional factors identified in other research studies were also included (see method

for details) as they have been shown to have strong associations with positive training behaviours, personality traits, and player well-being factors which are present during talent development programmes. Numerous studies argue for psychological factors to be considered as predictors of achievement in sport (MacNamara, Button & Collins, 2010; Rees, et al., 2016; Jones, Lawrence, & Hardy, 2018; Dunn, et al., 2019). However, the talent identification and development model continue to place limited emphasis on psychological factors, focusing predominately on current performance and physical characteristics instead. Identify the psychological differences between age grade rugby union playing standards is important as it allows practitioners to tailor psychological and personality profiles for players for talent development purposes (Rees, et al., 2016).

The purpose of the study was to identify the physiological and psychological differences between regional and club age grade players in rugby union across the annual age categories (e.g., under 16s, under 18s and elite Under 18s) and positions (e.g., forwards and backs). The aim was to add to the current existing research on physical and performance differences in regional age grade rugby union and identify the psychological differences between club and regional players. It is the initial step towards identifying the psychological factors that are important for age grade success in rugby union. It was hypothesised that in the age grade categories, anthropometric (e.g., height & weight) and physical performance (e.g., strength, power, and momentum) would be greater in regional players compared with club players, and that this difference would also be observed between elite under 18s and club/regional under 18s players. Positionally, regional forwards would be greater in size and have greater power and momentum than club forwards, whereas regional backs would be faster and stronger than club backs due to positional requirements. From a psychological perspective, and in line with previous research (MacMamara, Button & Collins, 2010; Cupples, 2021) we pre-empt regional players would score higher in positive psychological factors such as coping strategies, resilience, commitment, and openness to new experiences than club players. The elite under 18s would report experiencing greater stress levels due to increase in training load.

Methods

Participants

A total of 259 age grade rugby union players (Under 16s age: 15.0 ± 0.4 years, range 14.7 -17.0 years; Under 18s age: 16.5 ± 0.6 years, range 15.01 – 18.0 years; Elite Under18s age: 16.8 ± 0.6 years, range 15.11-17.5 years) participated in the study. All participants undertook anthropometric, physical, and psychological assessments. Data was collected from regional squads and eligible age-grade club rugby union players during two talent camps in April 2019 and February 2020. The methodology of the study was shared with parents and/or guardians following ethical approval and parental consent to participate (14 players were excluded for either having self-reported injuries, failure to complete questionnaires to a sufficient standard, or withdrawal from the study).

Table 1: Players categorised by age category, playing standards and positions.

Total Players *n* = 259									
Age Grade Group									
Under 16s *n* =146				**Under 18s** *n* = 113					
Playing Standard									
Regional *n* = 80		**Club** *n* = 66		**Regional** *n* = 49		**Club** *n* = 33		**Elite** *n* = 31	
Positions									
Forwards *n* = 44	**Backs** *n* = 36	**Forwards** *n* = 35	**Backs** *n* = 31	**Forwards** *n* = 26	**Backs** *n* = 23	**Forwards** *n* = 12	**Backs** *n* = 21	**Forwards** *n* = 19	**Backs** *n* = 11

Key: *n* =: Number of Players in category.

Design

A cross-sectional study design was employed to examine the difference in physiological and psychological factors between regional and club players and by positional categories. The talent camp included measures of height, weight, physical performance (e.g., speed, agility, strength, and power) and psychological factors via questionnaires.

Procedures

Anthropometric Measures

Height and body mass were collected during the morning of talent camps. Players removed all heavy garments and footwear prior to recording anthropometric measurements. Player's height was

measured using a portable stadiometer (HR001, Tanita Europe BV, Amsterdam, The Netherlands) and body mass was measured with the electronic column scales (Seca 799, GmbH, Hamburg, Germany).

Physical Performance

All participants had to complete a standardised warm-up administered by regional strength and conditioning coaches and were briefed on how to execute each assessment: -

Sprinting speed over 10 and 40m were recorded using timing gates (Brower Timing Systems, Draper, USA) which captured sprint times to the nearest 0.01s, with the best attempt of two recorded. Each sprint was completed twice with a 2-minute rest between each repetition. Player's momentum was calculated post-testing (Velocity was calculated for the 40m sprint and multiplied by the body weight to calculate the momentum over 40m). The average power over 40m, was calculated using the Harman Formula (Harman et al, 1991).

Counter movement jump was used to assess lower body power (JustJump, Probiotics Inc, Huntsville, AL, USA). Hands were positioned on the hips and when/if players dipped their hips prior to jumping, their results were not included (i.e., No Jump). The best jump height measured to the nearest cm from the three trials were recorded. Peak anaerobic power during the countermovement jump test was determined with the Sayer Equation (Sayers et al, 1999).

Grip strength test was used as a general indicator of upper body strength. Participants stood with their back against a wall with their testing arm at 10°-15° from the shoulder and elbow flexed at 90°. Measurements were recorded in both dominant and non-dominant arms (Takei 5001 Grip-A Handgrip Dynamometer, Takei Scientific Instruments Co, Nigata, Japan) with the highest score from two attempts recorded (Cronin, et al., 2017).

The arrowhead agility test time weas measured using timing gates (Brower Timing Systems, Draper, USA). Timing gates were mounted on tripods set at 1m from the floor and set 3m apart and positioned at the start/finish line. Players would sprint from marker (A) to marker (B), then quickly turn left (E) or right (C) and go around the side marker to the top of marker (D) before sprinting through the timing gates at marker (A) to finish the test (Vincenzo et al., 2020; See figure 1). Players would complete two trials on each side with >4 minutes of recovery between each repetition.

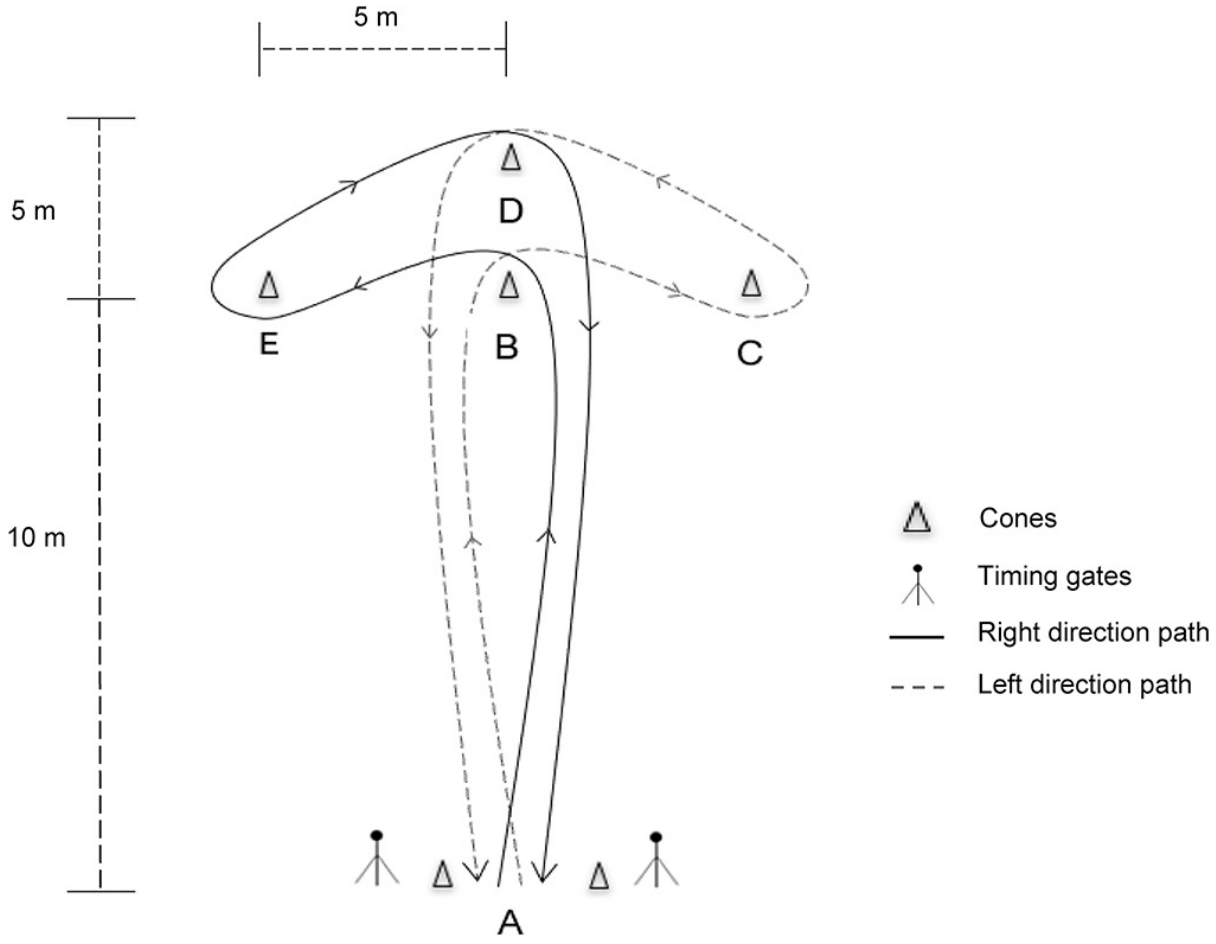

Figure 1: Layout of the arrowhead agility test (Image taken from, Vincenzo et al., 2020)

Personality Questionnaires

Two questionnaires' packs were administered to players during the talent camp. The first questionnaire pack gathered demographic information (e.g., age, position, years at competitive level, injury history and extracurricular activities) and training behaviours (e.g., goal orientation, commitment, athlete identity). The second questionnaire pack examined competitive experiences and personality traits (e.g., optimism, perfectionism, alexithymia). In the second talent camp additional psychological factors were recorded (e.g., athlete burnout, coping strategies). For further information on the original sources and items used, see table 2.

Table 2: Summary of measures used in psychological questionnaire packs 1 and 2.

Measure & Item Origin	Subscale	Items from Original Construct	Factor Loading	Author
TRAINING BEHAVIOURS				
Perception of Success (Roberts, Treasure, & Balague, 1998)	Outcome Focus	1. When doing sport, I feel successful when I beat other people.	.66	Items taken from the ADFS (Dunn et al., 2019)
		2. When doing sport, I feel successful when I outperform my opponents.	.62	
	Mastery Focus	1. When doing sport, I feel successful when I perform to the best of my ability.	.62	
		2. When doing sport, I feel successful when I show clear personal improvements.	.72	
Quality of Training Inventory (Woodman et al., 2010)	Commitment to Training	1. I always produce a high-quality training session. 2. No matter what is going on in my life, I still turn in a good training session.		Items taken from the ADFS (Dunn et al., 2019)
Inclusion of Others in the Self Scale (Aron, Aron, & Smollan, 1992)	Athlete Identity	1. My sport is the most important thing in my life. 2. My sport offers me more than anything else in life (e.g., friends, family, relationships, money).		Items taken from the ADFS (Dunn et al., 2019)
Behavioural Regulation in Sport (Lonsdale, Hodge, & Rose, 2008)	Amotivation	1. but I question why I continue. 2. but the reason why are not clear to me anymore	.90 .89	Items taken from the BRSQ-6 (Lonsdale, Hodge, & Rose, 2008)
	External Regulation	1. because people push me to play 2. because I feel pressure from other people to play	.85 .84	
	Introjected Regulation	1. because I would feel guilty of I quit 2. because I fee; obligated to continue	.78 .88	
	Identified Regulation	1. because the benefits of sport are important to me 2. because it teaches me self-discipline	.80 .57	
	Integrated Regulation	1. because it's an opportunity to just be who I am 2. because what I do in sport is an expression of who I am	.70 .77	
	IM-General	1 because I enjoy it 2. because I like it	.82 .81	

Performance-based Self-Esteem (Hallsten, Josephson, & Torgén, 2005)	Self-Esteem	1. I think that I can sometimes try to prove my worth by being competent. 2. My self-esteem, is far too dependent on my daily achievements. 3. At times, I have to be better than others to be good enough myself. 4. Occasionally I feel obsessed to accomplish something of value.	Range from .70 to .84	Items taken from the Pbse-scale (Hallsten, Josephson, & Torgén, 2005)
Athlete Coping Skills Inventory-28 (Smith, et al., 1995)	Coping with Adversity	1. I maintain emotional control no matter how things are going for me. 2. When things are going badly, I tell myself to keep calm, and this works for me.	.60 .58	Items taken from the ACSI-28 (Smith, et al., 1995_
	Performing Under Pressure	1. To me, pressure situations are challenges that I welcome. 2. The more pressure there is during a game, the more I enjoy it.	.77 .71	
	Goal Setting/Mental Preparation	1. On a daily or weekly basis, I set very specific goals for myself that guide what I do. 2. I tend to do lots of planning about how to reach my goals.	.69 .68	
	Concentration	1. I handle unexpected situations in my sport very well. 2. When I am playing sports, I can focus my attention and block out distractions.	.63 .68	
	Free from Worry	1. While competing, I worry about making mistakes or failing to come through (**). 2. I put a lot of pressure on myself by worrying how I will perform (**).	.76 .66	
	Confidence and Achievement Motivation	1. I feel confident that I will play well. 2. I get the most out of my talent and skills.	.65 .62	
	Coachability	1. If a coach criticizes or yells at me, I correct the mistake without getting upset about it. 2. I improve my skills by listening carefully to advice and instruction from coaches and manager	.77 .57	

Measure & Item Origin	Subscale	Items from Original Construct	Factor Loading	Author
		PERSONALITY TRAITS		
The Multidimensional Inventory of Perfectionism in Sport (Stoeber et al., 2006)	Perfectionistic Concerns	1. During training, I get completely furious if I make mistakes. 2. During training, I get frustrated if I do not fulfil my high expectations. 3. During competition, I get completely furious if I make mistakes. 4. During competition, I get frustrated if I do not fulfil my high expectations.	Range from .86 - .91	Items taken from the ADFS (Dunn et al., 2019)
The Sport Multidimensional Perfectionism Scale 2 (Gotwals & Dunn, 2009)	Perfectionistic Strivings	1. I feel that other athletes generally accept lower standards for themselves in sport than I do. 2. I have extremely high goals for myself in sport.	.63 .53	Items taken from the ADFS (Dunn et al., 2019)
Big Five-Inventory-10 (Gosling, Rentfrow, & Swann, 2003)	Extraversion	1. I see myself as: extraverted, enthusiastic. 2. I see myself as: reserved, quiet.	.77	Items taken from the ADFS (Dunn et al., 2019)
	Agreeableness	1. I see myself as critical, quarrelsome. 2. I see myself as: sympathetic, warm.	.71	
	Conscientiousness	1. I see myself as: dependable, self-disciplined. 2. I see myself as: disorganised, careless .	.76	
	Emotional Stability	1. I see myself as: anxious, easily upset. 2. I see myself as: calm, emotionally stable.	.70	
	Openness to Experiences	1. I see myself as: open to new experiences, complex. 2. I see myself as: conventional, uncreative.	.62	
Life Orientation Test, (Scheier,, & Carver, 1985)	Optimism	1. In uncertain times, I usually expect the best. 2. I always look on the bright side of things. 3. I'm always optimistic about my future. 4. I'm a believer in the idea that “every cloud has a silver lining".	.56 .72 .61 .66	Items taken from the LOT (Scheier, & Carver, 1985)
The Brief Emotional Intelligence Scale (Davies, et al., 2010)	Appraisal of own emotions	1. I know why my emotions change. 2. I easily recognise my emotions as I experience them.	.77 .62	Items taken from the BEIS-10 (Davies, et al., 2010)
	Appraisal of others; emotions	1. I can tell how people are feeling by listening to the tone of their voice. 2. By looking at their facial expressions, I recognise the emotions people are experiencing .	.72 .65	

	Regulation of own emotions	1. I seek out activities that make me happy 2. I have control over my emotions	.71 .83	
	Regulations of others' emotions	1. I arrange events others enjoy. 2. I help other people feel better when they are down.	.91 .68	
	Utilisation of emotions	1. When I am in a positive mood, I am able to come up with new ideas. 2. I use good moods to help myself keep trying in the face of obstacles.	.65 .68	
Toronto Alexithymia Scale – 20 (Bagby, Parker, & Taylor, 1994)	Difficulty Identifying Feelings	1. I have feelings that I cannot quite identify 2. I do not know what is going on inside me	.77 .66	Items taken from the TAS-20 (Bagby, Parker, & Taylor, 1994)
	Difficulty Describing Feelings	1. It is difficult for me to find the right words for my feelings. 2. I find it hard to describe how I feel about people.	.70 .54	
	Externally Orientated Feelings	1. Being in touch with emotions is essential (**). 2. I find examination of my feelings useful in solving personal problems (**).	.47 .62	

Measure & Item Origin	**Subscale**	**Items from Original Construct**	**Factor Loading**	**Author**
PSYCHOLOGICAL FACTORS				
Athlete Burnout Measure (Raedeke, & Smith, 2001)	Emotional Exhaustion	1. I feel so tired from my training that I have trouble finding energy to do other things. 2. I feel overly tired from my [sport] participation. 3. I feel "wiped out" from [sport]. 4. I feel physically worn out from [sport]. 5. I am exhausted by the mental and physical demand of [sport].	.66 .69 .70 .63 .70	Items taken from the ABQ (Raedeke, & Smith, 2001)
	Reduce Sense of Accomplishment	1. I'm accomplishing many worthwhile things in [sport]. 2. I am not achieving much in [sport]. 3. I am not performing up to my ability in [sport]. 4. It seems that no matter what I do, I don't perform as well as I should. 5. I feel successful at [sport].	.67 .60 .57 .78 .66	
	Sport Devaluation	1. The effort I spend in [sport] would be better spent doing other things. 2. I don't care as much about my [sport] performance as I used to.	.63 .50	

		3. I'm not into [sport] like I used to be. 4. I feel less concerned about being successful in [sport] as I used to be. 5. I have negative feelings towards [sport].	.82 .66 .65	
Perceived Stress Scale (Cohen, et al., 1983)	Global Stress & Training Stress	1. In the last week, how often have you felt that you were unable to control the important things in your life? 2. In the last week, how often have you felt confident about your ability to handle your personal problems? (**). 3. In the last week, how often have you felt that things were going your way? (**). 4. In the last week, how often have you felt difficulties were piling up so high that you could not overcome them?	Range from .82 to .86	Items taken from the PSS (Cohen, et al., 1983)

Key: ** = Reverse Score (i.e., 1 =5, 2 =4, 3 = 3, 4 = 2 and 5 =1).

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Statistical Analysis

All statistical analysis was calculated using IBM SPSS V.25.0. To examine the differences in between regional age grade and club players a two-way multivariate analysis of variance (two-way MANOVA) test was applied as there were two or more dependent (i.e., anthropometric measurements, physical performance assessments and questionnaire responses) and independent variables (i.e., selection level (regional vs club) as a fixed factor for each age category (Under 16s, Under 18s & Academy), and positional group (Forwards and Backs)). All recorded results were reported as descriptive data using means and standard deviations (Mean ± *SD*). Shapiro-Wilk Test was used to examine the assumptions of normality for all variables with the statistical significance accepted when Wilks' Λ was $p < 0.05$. When a statistical significance was observed the Bonferroni within group post hoc comparison test would indicate a significant mean score variation.

Results

Anthropometrics

In the under 16s, regional players were taller and heavier than club players. Particularly, under 16s regional forwards were taller and heavier than club forwards. A similar trend in body mass was observed between regional and club players at under 18s level, with regional under 18s players and regional under 18s backs being heavier than their corresponding club players. Additionally, body mass was greater amongst the elite cohort, with elite forwards and elite backs being heavier than the under 18s cohort. The elite backs were also taller than the under 18s backs (See appendices tables 1 to 5 for additional results).

Physical Performances

In the under 16s, regional players were stronger in the dominant hand grip strength, faster over 40m, and had greater momentum, power over 40m and had a greater peak anaerobic power in the countermovement jump than under 16s club players. Whereas under 16s club players were faster in both dominant and non-dominant legs in completing the agility test. A similar trend was observed between under 16s regional and club backs, were under 16s club backs were also faster in both dominant and non-dominant legs in completing the agility test than regional backs. Positionally, the

under 16s regional backs were stronger in dominant and non-dominant hand grip strength and were faster over 10m and 40m than their club counterparts. Whereas, under 16s regional forwards were greater in momentum, power over 40m and peak anaerobic power in the countermovement jump than club forwards.

In the under 18s, regional players were greater in momentum, power, and peak anaerobic power in the countermovement jump than club players. A similar trends was observed between under 18s regional and club backs, where regional backs were greater in momentum and power over 40m than their corresponding counterparts. Additionally, under 18s regional forwards were stronger in both dominant and non-dominant arms in the grip strength test than under 18s club forwards.

In the elite under 18s, elite players, and elite forwards were stronger in both dominant and non-dominant arms in grip strength and peak anaerobic power in the countermovement jump than the under 18s cohort (see table 3 for details). Furthermore, elite players generated greater momentum, power over 40m, and peak anaerobic power in the countermovement jump than their corresponding counterparts. A similar trend was observed between elite backs and under 18s backs, were elite backs had a greater momentum, power, peak anaerobic power a stronger non-dominant hand grip strength and were faster in their non-dominant leg in the agility test than their corresponding counterparts (See appendices tables 1 to 5 for additional results).

Personality Traits and States

In the under 16s, regional players score higher in *perfectionistic strivings* and *achievement motivation* when compared with club players. A similar trend was observed between under 16s regional and club forwards, with regional forwards scoring higher in *achievement motivation* than their corresponding counterparts. Additionally, under 16s club forwards scored higher in *alexithymia* and *integrated motivation*. The under 16s regional backs scored higher in in *coping strategies* and *concentration* than club backs (See table 4 for details).

In the under 18s, club players scored higher in *athlete burnout, sport devaluation, coping strategies* and *concentration* (see table 4 for details). A similar trend was observed between under 18s regional and club forwards, were club forwards scored higher in *coping strategies* and *concentration*, and regional under 18s forwards scored higher on the *alexithymia* scale. Furthermore, under 18s club

backs scored higher in *athlete identity, alexithymia, difficulty identifying feelings, difficulty describing feelings* and *freedom from worry* than their corresponding counterparts.

In the elite under 18s, elite players scored higher in *optimism* and *perfectionistic strivings.* Additionally, it was observed that the under 18s players scored higher in *coachability* than the elite cohort. Positionally there were differences between elite and under 18s forwards, with elite forwards scoring higher in *optimism* and *perfectionistic strivings*. Whereas the elite under 18s backs scored higher in *emotional exhaustion, training stress* and *introjected regulation* than their corresponding counterparts and the under 18s backs scored higher in *extraversion,* and *concentration* than elite backs (See appendices tables 1 to 5 for additional results).

Table 3: The significant physiological results for age grade players in each age-category, playing level and position

AGE GRADE	UNDER 16s			UNDER 18s			Elite Under 18s		
	REGIONAL	**CLUB**	***P***	**REGIONAL**	**CLUB**	***P***	**ELITE**	**UNDER 18s**	***P***
Height (cm)	176.8 ± 6.5	173.8 ± 7.0	**0.008****	179.9 ± 5.6	177.8 ± 7.1	0.145	181.0 ± 6.1	179.0 ± 6.3	0.134
Weight (kg)	76.0 14.6	70.3 ± 13.5	**0.017****	84.6 ± 13.7	76.4 ± 11.0	**0.005****	87.2 ± 11.2	81.3 ± 13.2	**0.029****
Countermovement Jump (cm)	47.6 ± 6.9	46.2 ± 6.4	0.202	51.7 ± 7.9	52.9 ± 7.5	0.509	53.0 ± 7.8	52.2 ± 7.7	0.639
DH Grip Strength (kg)	40.9 ± 6.1	38.6 ± 6.7	**0.033****	47.1 ± 6.5	45.7 ± 5.6	0.345	49.8 ± 8.2	46.5 ± 6.2	**0.026****
NDH Grip Strength (kg)	37.7 ± 6.5	35.9 ± 7.0	0.114	44.0 ± 6.5	41.8 ± 5.1	0.109	47.4 ± 7.1	43.1 ± 6.0	**0.002****
10m Sprint (s)	1.81 ± 0.12	1.84 ± 0.10	0.072	1.78 ± 0.09	1.78 ± 0.10	0.918	1.78 ± 0.09	1.78 ± 0.09	0.788
40m sprint (s)	5.63 ± 0.34	5.83 ± 0.39	**0.002****	5.52 ± 0.27	5.51 ± 0.42	0.856	5.50 ± 0.30	5.51 ± 0.33	0.835
DL Agility (s)	8.75 ± 0.43	8.44 ± 0.30	**0.002****	8.49 ± 0.47	8.30 ± 0.27	0.116	8.29 ± 0.47	8.40 ± 0.40	0.426
NDL Agility (s)	8.92 ± 0.43	8.59 ± 0.36	**0.001****	8.63 ± 0.47	8.49 ± 0.26	0.221	8.43 ± 0.43	8.57 ± 0.39	0.290
Momentum (kg/ms)	540 ± .94.2	483 ± 83.5	**0.000****	611 ± 82.8	551 ± 68.3	**0.002****	632 ± 58.3	588 ± 82.3	**0.008****
Power (w)	5293 ± 923.0	4634 ± 819.0	**0.000****	5988 ± 811.6	5402 ± 668.4	**0.002****	6196 ± 571.5	5761 ± 807.2	**0.009****
PAP (w)	4247 ± 766.1	3925 ± 630.8	**0.008****	4902 ± 565.0	4594 ± 465.0	**0.014****	7162 ± 420.6	4776 ± 544.9	**0.000****
FORWARDS	**REGIONAL**	**CLUB**	***P***	**REGIONAL**	**CLUB**	***P***	**ELITE**	**UNDER 18s**	***P***
Height (cm)	179.2 ± 5.9	175.5 ± 5.5	**0.004****	181.7 ± 5.9	1817 ± 6.6	0.995	182.0 ± 7.1	180.5 ± 6.0	0.406
Weight (kg)	82.9 ± 14.8	74.5 ± 15.1	**0.019****	91.5 ± 14.9	84.9 ± 11.3	0.184	94.1 ± 13.8	84.9 ± 12.9	**0.017****
Countermovement Jump (cm)	45.7 ± 6.4	44.9 ± 6.6	0.602	49.3 ± 7.1	47.6 ± 8.7	0.542	51.4 ± 8.3	48.8 ± 7.5	0.238
DH Grip Strength (kg)	41.2 ± 5.2	40.3 ± 6.5	0.482	52.8 ± 5.7	44.7 ± 5.5	**0.012****	51.3 ± 8.6	46.8 ± 7.0	**0.043****
NDH Grip Strength (kg)	37.4 ± 5.4	37.6 ± 7.2	0.898	50.4 ± 7.4	40.2 ± 2.9	**0.006****	47.6 ± 7.5	43.3 ± 7.0	**0.039****
10m Sprint (s)	1.85 ± 0.13	1.86 ± 0.11	0.619	1.81 ± 0.08	1.85 ± 0.12	0.276	1.82 ± 0.09	1.82 ± 0.09	0.935
40m sprint (s)	5.77 ± 0.32	5.91 ± 0.41	0.097	5.63 ± 0.26	5.83 ± 0.47	0.136	5.65 ± 0.27	5.69 ± 0.34	0.639
DL Agility (s)	8.65 ± 0.33	8.90 ± 0.53	0.093	8.46 ± 0.37	8.77 ± 0.60	0.219	8.46 ± 0.37	8.40 ± 0.32	0.409
NDL Agility (s)	8.82 ± 0.38	9.09 ± 0.48	0.069	8.63 ± 0.36	8.88 ± 0.61	0.338	8.63 ± 0.37	8.55 ± 0.32	0.583
Momentum (kg/ms)	577 ± 90.2	505 ± 83.3	**0.001****	645 ± 89.2	592 ± 66.5	0.104	661 ± 72.1	617 ± 78.5	0.057
Power (w)	5658 ± 883.3	4946 ± 816.3	**0.001****	6317 ± 873.8	5801 ± 650.4	0.103	6382 ± 545.2	6165 ± 839.3	0.317
PAP (w)	4488 ± 604.6	4020 ± 644.1	**0.002****	5062 ± 573.3	4709 ± 481.4	0.086	7293 ± 455.5	4951 ± 564.1	**0.000****
BACKS	**REGIONAL**	**CLUB**	***P***	**REGIONAL**	**CLUB**	***P***	**ELITE**	**UNDER 18s**	***P***
Height (cm)	173.9 ± 6.2	171.8 ± 8.0	0.233	177.8 ± 4.7	175.6 ± 6.5	0.183	180.5 ± 4.1	176.8 ± 5.7	**0.045****
Weight (kg)	67.5 ± 8.8	65.6 ± 9.6	0.389	76.8 ± 6.1	71.5 ± 7.2	**0.011****	79.7 ± 7.2	74.2 ± 7.1	**0.028****
Countermovement Jump (cm)	50.0 ± 6.8	47.6 ± 5.9	0.134	54.4 ± 8.0	55.8 ± 5.0	0.515	55.3 ± 6.4	55.2 ± 6.7	0.952
DH Grip Strength (kg)	40.5 ± 7.1	36.6 ± 6.6	**0.026****	45.9 ± 5.0	46.6 ± 6.0	0.685	47.1 ± 6.8	46.2 ± 5.4	0.786
NDH Grip Strength (kg)	38.0 ± 7.8	33.7 ± 6.3	**0.021****	43.3 ± 4.6	42.7 ± 5.7	0.712	46.8 ± 7.3	43.0 ± 5.1	**0.044****
10m Sprint (s)	1.76 ± 0.09	1.82 ± 0.09	**0.010****	1.74 ± 0.09	1.74 ± 0.07	0.919	1.71 ± 0.04	1.74 ± 0.08	0.245
40m sprint (s)	5.47 ± 0.29	5.73 ± 0.34	**0.002****	5.39 ± 0.21	5.33 ± 0.26	0.453	5.23 ± 0.17	5.36 ± 0.23	0.101
DL Agility (s)	8.90 ± 0.53	8.57 ± 0.24	**0.041****	8.53 ± 0.60	8.29 ± 0.30	0.253	7.98 ± 0.29	8.39 ± 0.46	**0.049****
NDL Agility (s)	9.09 ± 0.48	8.76 ± 0.35	**0.044****	8.64 ± 0.61	8.52 ± 0.28	0.564	8.17 ± 0.27	8.58 ± 0.44	**0.042****
Momentum (kg/ms)	494 ± 78.5	457 ± 77.2	0.062	571 ± 52.6	529 ± 59.5	**0.027****	602 ± 50.8	551 ± 59.2	**0.015****
Power (w)	4845 ± 768.4	4477 ± 757.7	0.062	5594 ± 516.5	5181 ± 583.3	**0.026****	5901 ± 496.5	5399 ± 580.5	**0.016****
PAP (w)	3952 ± 845.4	3822 ± 609.7	0.488	4719 ± 508.1	4531 ± 455.6	0.221	6916 ± 227.0	4627 ± 486.5	**0.000****

Key: *P* = p-value <0.005; ** Statistically Significant; n = Number of Participants; ± = Mean & Standard Deviation

Table 4: The significant psychological results for age grade players in each age-category, playing level and position

AGE GRADE	UNDER 16s			UNDER 18s			Elite Under 18s		
	REGIONAL	**CLUB**	***P***	**REGIONAL**	**CLUB**	***P***	**ELITE**	**UNDER 18s**	***P***
Athlete Burnout	28.1 ± 5.2	29.9 ± 6.9	0.083	30.1 ± 6.3	33.2 ± 7.0	**0.045****	32.2 ± 6.5	31.4 ± 6.7	0.566
Sport Devaluation	7.6 ± 2.4	7.8 ± 2.5	0.487	8.1 ± 2.5	9.4 ± 3.1	**0.038****	8.4 ± 2.7	8.6 ± 2.8	0.686
Optimism	14.6 ± 2.2	14.0 ± 2.3	0.110	13.9 ± 2.2	13.9 ± 2.7	0.962	15.1 ± 2.3	13.9 ± 2.4	**0.018****
Perfectionistic Striving	7.2 ± 1.3	6.7 ± 1.3	**0.029****	6.3 ± 1.2	6.5 ± 1.4	0.476	7.1 ± 1.2	6.4 ± 1.3	**0.007****
Coping Strategies	28.2 ± 5.3	26.5 ± 5.1	0.160	25.2 ± 4.0	29.9 ± 4.6	**0.010****	25.6 ± 4.6	26.7 ± 4.7	0.456
Concentration	4.4 ± 1.1	4.2 ± 1.2	0.509	3.9 ± 0.71	4.9 ± 0.78	**0.004****	3.8 ± 0.97	4.3 ± 0.84	0.118
Achievement Motivation	4.1 ± 1.1	3.5 ± 1.1	**0.040****	3.4 ± 0.96	3.9 ± 0.93	0.186	3.7 ± 1.2	3.5 ± 0.96	0.605
Coachability	5.1 ± 1.1	4.7 ± 1.2	0.191	5.0 ± 1.2	5.3 ± 1.0	0.464	4.3 ± 0.73	5.1 ± 1.1	**0.016****
FORWARDS	**REGIONAL**	**CLUB**	***P***	**REGIONAL**	**CLUB**	***P***	**ELITE**	**UNDER 18s**	***P***
Optimism	14.3 ± 2.2	13.7 ± 2.6	0.270	14.2 ± 1.9	14.8 ± 2.5	0.486	15.8 ± 1.9	14.4 ± 2.1	**0.019****
Alexithymia	14.9 ± 2.6	16.1 ± 2.9	0.052	16.1 ± 2.6	13.9 ± 3.1	**0.033****	14.7 ± 2.8	15.4 ± 2.9	0.401
Perfectionistic Striving	7.2 ± 1.4	6.7 ± 1.4	0.184	7..2 ± 1.3	6.6 ± 1.4	0.285	7.2 ± 1.3	6.3 ± 1.2	**0.008****
Integrated Regulation	8.8 ± 1.8	11.0 ± 2.5	**0.010****	10.2 ± 2.8	11.6 ± 2.7	0.308	11.2 ± 2.1	10.7 ± 2.6	0.804
Coping Strategies	28.1 ± 5.2	27.1 ± 5.2	0.568	24.7 ± 4.4	31.5 ± 5.1	**0.024****	26.7 ± 4.0	26.5 ± 5.4	0.949
Concentration	4.2 ± 1.2	4.5 ± 1.3	0.433	4.0 ± 0.63	5.3 ± 0.96	**0.011****	4.1 ± 0.90	4.3 ± 0.90	0.568
Achievement Motivation	4.1 ± 1.0	3.4 ± 0.94	**0.041****	3.3± 0.90	4.0 ± 0.82	0.183	4.1 ± 0.93	3.5 ± 0.92	0.111
BACKS	**REGIONAL**	**CLUB**	***P***	**REGIONAL**	**CLUB**	***P***	**ELITE**	**UNDER 18s**	***P***
Exhaustion	9.2 ± 2.5	10.1 ± 3.7	0.242	10.1 ± 3.1	10.9 ± 3.7	0.438	13.0 ± 2.6	10.5 ± 3.4	**0.026****
Training Stress	6.5 ± 2.0	6.7 ± 2.3	0.761	7.3 ± 1.5	7.1 ± 2.5	0.774	9.2 ± 1.6	7.2 ± 2.0	**0.006****
Athlete Identity	6.9 ± 1.8	6.3 ± 1.8	0.144	5.5 ± 2.1	6.8 ± 1.5	**0.024****	6.0 ± 1.9	6.1 ± 1.9	0.850
Alexithymia	14.7 ± 3.3	14.5 ± 3.0	0.766	12.8 ± 3.8	16.0 ± 3.4	**0.006****	15.8 ± 2.3	14.4 ± 2.9	0.223
DIF	4.7 ± 1.5	4.2 ± 1.4	0.180	3.4 ± 2.0	4.8 ± 1.2	**0.008****	4.5 ± 1.4	4.0 ± 1.8	0.420
DDF	4.6 ± 2.0	4.4 ± 1.5	0.726	3.4 ± 2.2	5.6 ± 2.2	**0.002****	5.2 ± 1.7	4.5 ± 2.5	0.376
Extraversion	9.6 ± 2.1	9.4 ± 2.1	0.697	9.4 ± 1.9	8.9 ± 1.6	0.422	7.9 ± 1.5	9.1 ± 1.7	**0.041****
Introjected Regulation	3.5 ± 1.6	4.9 ± 3.3	0.122	5.1 ± 3.2	3.8 ± 2.3	0.327	7.6 ± 3.8	3.5 ± 2.1	**0.011****
Coping Strategies	28.7 ± 4.8	24.9 ± 4.5	**0.021****	25.9 ± 3.4	28.6 ± 4.4	0.236	23.6 ± 5.4	26.9 ± 3.9	0.163
Concentration	4.6 ± 1.0	3.9 ± 0.95	**0.033****	3.9 ± 0.83	4.6 ± .55	0.115	3.2 ± 0.84	4.2 ± 0.80	**0.040****
Free from Worry	2.8 ±1.5	3.5 ± 1.7	0.242	2.5 ± 1.2	4.0 ± 0.71	**0.029****	2.6 ± 0.89	3.1 ± 1.3	0.452
Coachability	5.2 ± 1.1	4.6 ± 1.1	0.157	5.5 ± 0.76	5.2 ± 1.1	**0.**568	4.2 ± 0.45	5.4 ± 0.87	**0.011****

Key: *P* = p-value <0.005; ** Statistically Significant; n = Number of Participants; ± = Mean & Standard Deviation

Discussion

The present study examined the physiological and psychological differences between regional and club age grade rugby union players. The main findings emphasised that regional players were greater anthropometrically and were more robust in their physical abilities to perform better than club players. Additionally, the main findings in psychological factors emphasise the differences were more so between positions rather than playing levels. Further, unexpected differences were found between regional and club players, where club players score higher than regional players in positive psychological factors and training behaviours. The study adds to the present understanding of anthropometrical and performance selection in the talent identification and development pathway for age grade rugby. The present findings demonstrate differences between regional and club players for anthropometrics, physical performance, and psychological factors.

Across all age-grade-categories, especially in forwards, weight differentiated players in regional and club level. Players selected for regional representation and invited to the elite under 18s academy were heavier than lower playing standards. Tracking the anthropometrics measurements of young rugby players is considered important to ensure optimal development of a specific somatotype (Austin, Gabbett, & Jenkins, 2011) because anthropometric characteristics such as height and weight have previously been identified as key discriminators of playing level within rugby (Brazier et al., 2020) and has been shown to be associated with team and individual success (Brooks, & Kempo, 2008). Due to the rapid increase in popularity and professionalism of rugby, physical profiles of elite players require greater size and stature (Brazier et al., 2020; Fontana et al, 2017; Sedeaud et al, 2012; Duthie, Pyne & Hooper, 2003; Olds, 2001). In the rugby union World Cup, 20 years of data reported teams who made it to the quarterfinal, semi-finals and final were taller and heavier than any other teams at the competition (Sedeaud et al., 2012). The change in height of players over a 20-year period (e.g., forwards were taller by a mean of 2.9 cm and 5.4 cm for backs) suggest height has become a key discriminator during talent identification, as taller players are more likely to be successful in the development pathway. A similar trend was observed in body mass, from the 1970's to the early 2000s, a dramatic increase in mass has been observed in rugby union forwards and backs (e.g.,

forwards are 11kg heavier, (Olds, 2001) and backs are 12kg heavier; Sedeaud et al, 2016. Players who are heavier have a greater chance of success.

The main findings for physical performance in the study highlighted strength, momentum, and power over 40m sprint to be superior in regional age grade categories. These findings were consistent with previous studies (Barker et al., 1993; Williams & Reilly, 2000; Vaeyens et al., 2006, Gabbett et al., 2011; Gabbett, Comerford, & Stanton, 2014; Baker, 2017; Chiwaridzo et al, 2019) and are considered desirable qualities, considering the demands of the sport (Brazier et al, 2020). Amongst the forwards, the physical demands are to dominate scrums, lineouts, rucks, and tackles, which require greater height, weight, strength, and power for optimal performance and dominance (Duthie et al, 2006). Elite under 18s forwards presented more optimal strength and generated greater anaerobic power in the countermovement jump than under 18s regional and club forwards. Greater body size, alongside greater strength and power results in greater force production and momentum which is used to gain ground and maintain possession during a match **(**Duthie, Pyne and Hooper, 2003).

The regional under 16s backs were faster over 10m and 40m and had greater strength than their club counterparts. Whereas elite under 18s backs were significantly greater in strength, agility, momentum, power over 40m and peak anaerobic power in the countermovement jump when compared with regional and club backs, the characteristics required to gain ground quickly and efficiently to beat the opposition. Acceleration over 10m provides an insight into a player's potential as it is recognised as a fundamental to success in rugby (Deutsch, Kearney, Rehrer, 2007). Regional backs were more competent at accelerating quickly over 10m than club players, and their time improved as they progressed through the pathway. At elite level, the ability to beat the opposition has been associated in a previous study to be associated with jump height (Brazier et al, 2020**)**. Jump height did not differentiate regional and club players, however, peak anaerobic power in the countermovement jump differentiated regional and club players in all age grade categories with regional players generating greater anaerobic power than their regional counterparts. Greater anaerobic power was most prevalent amongst the elite cohort as the only the more powerful players can continue playing at elite level (Kobal et al., 2016).

The psychological differences amongst age grade rugby players in regional and club settings have not previously been investigated in depth, yet several studies have identified psychological differences between athletes and non-athletes (Butt, 1987; Cox, 1994; Saint-Phard et al., 1999; Steca, Baretta, Greco, D'Addario, & Monzani, 2018; Kruger, Plooy, & Kruger, 2019; Steinbrink, Berger, & Kuckertz, 2020). This research aimed to look at a large amount of psychological factors to differentiate the psychological profiles of club and regional players. Perfectionistic strivings were higher amongst regional players (i.e., under 16s & elite under 18s) than club players, with under 16s regional players scoring higher in achievement motivation and elite players scoring higher in optimism. Perfectionistic strivings are associated with having a strong sense of commitment towards exceptionally high-performance standards and is validated by self-worth, its energising force, motivates an individual towards exceeding expectations (Hill & Appleton, 2011). However, in circumstances where an individual does not meet their own standards their self-worth can become damaged and often lead to athlete burnout (Hill & Appleton, 2011). Regional representatives in all age grades and positions presented negative psychological characteristics such as lack of an athlete identity, scoring higher in emotional exhaustion and, introjected regulation. These findings suggest that regional players maybe training and performing due to a sense of obligation and compliance, driven by rewards and punishment rather than an internal desire or enjoyment (Calovo et al., 2010; Uzun, & Aydemir, 2019). Whereas, under 16s club forwards have a higher integrated regulation suggesting these club players have an inherent pleasure from participating in rugby (Lonsdale, Hodge, & Rose, 2008) because of how they value their sense of self (Ryan & Deci, 2002). The internal pressures (i.e., guilt, shame, and anxiety) regional players place on themselves in the aim to increases their ego and the validation of their self-worth (Medic, Mack, Wilson & Starkes, 2007; Lonsdale, Hodge, Rose, 2008) presents a potential explanation for the increase in introjected regulation at each successive level for the regional backs (e.g., Under 16s: 3.5 ± 1.6; Under 18s: 5.1 ± 3.2; Elite Under 18s: 7.6 ± 3.8) along with athlete burnout (e.g., Under 16s: 28.4 ± 4.5; Under 18s: 31.4 ± 7.4; Elite Under 18s: 36.0 ± 4.2). Medic et al (2007) have found male athletes with sport scholarships to be more likely to report higher scores of introjected regulation.

Till et al, 2020, emphasised that there is a lack of research in understanding the psychological

demands placed upon age grade rugby union players as they progress into professional players. Talent identification and development models ignore the coping strategies that enable young players to successfully develop within the pathway (MacNamara, Button, & Collins, 2010). Coping skills is associated with managing performance related stress, and in rugby the most predominant stressor is injury concerns, and making a physical or mental error (Nichollos, Holt, & Bloomfield, 2006). The ability to cope is important to aid players to effectively manage stressors, however, coping skills varied between playing levels in this study. In the under 16s, regional forwards and backs reported greater coping skills than club counterparts, specifically in regards to their achievement motivation and concentration skills. Increased concentration skills and effort are amongst the four top frequently cited strategies used by professional rugby union players (Nichollos, Holt, & Bloomfield, 2006). However, in the under 18s, club players score higher in concentration skills (e.g., under 18s forwards) and freedom from worry (e.g., under 18s backs) than regional players. A similar trend was observed between elite under 18s and the age grade under 18s, where elite under 18s have lower concentration skills and were less coachable than their age grade counterparts. The findings amongst the elite under 18s differ from previous studies, Kruger, (2005) reported that the Super 12 South African players scored higher in coping skills, concentration skills, mental preparation, confidence, coachability, achievement motivation and freedom from worrying when compared to the senior South African club rugby players. From these results by Kruger (2003, 2005) it suggests that psychological skills such as coping strategies are related to success in rugby and are required to distinguish between rugby union players from different successive levels emphasising the importance of being able to maintain emotional control whilst being positive and enthusiastic no matter the situation (Andrew, Potgieter, & Grobbelaar, 2007). These surprising findings, reveal that club players and players at the early stages of the development pathway (i.e., under 16s) were better at stress management (i.e., concentration, mental preparation, freedom from worry; Smith et al., 1995) than their regional counterparts. Coping strategies seem to decrease as training demands and competitive pressure increases. When identifying players, it is necessary to make note of who is susceptible to derailment, and who possess the psychological mechanisms of achieving success (Durand-Bush & Salmela, 2002), to allow coaches to support young players in their development and to translate their potential into capability.

This study had strengths in relation to combining the physical, psychological and performance characteristics of talent identification in a regional age grade talent camps. The incorporation of psychological factors is emerging in sport science and this study adds to the research in developing a holistic talent identification process. According to Cox and Yoo (1995) the primary selection criteria for rugby players should be an individual's physique, strength, speed and skill level and it has been noted by Cox and Yoo (1995) that players in the player pathway need to develop sport psychological skills as it can distinguish between rugby players from different participation levels.

The choice of physical tests is a limitation for this study because previous research have measured players aerobic capacity and used different assessments to measure strength (See Owen et al., 2020). A well-developed aerobic capacity is a key characteristic for rugby union players as it presents a players ability to recovery between high intensity match phases (Duthie, 2006). Owen and colleagues (2020) presented six-teen studies which investigated aerobic capacity of age grade rugby union players with six different testing protocols (i.e., Multistage Fitness Test, VO_2 Max, Yo-Yo Endurance Test 1, Bronco, yo-Yo Intermittent Recovery 1, and 30:15 Intermittent Fitness Test). A high-intensity, aerobic running ability test such as the 30:15 Intermittent Fitness Test or the Bronco Test (1.2km running intervention) are widely used in the rugby environment (Miles et al., 2019). Both measure the physical competency and aerobic fitness of large cohorts (Scott et al, 2015). Rugby requires a high level of aerobic capacity for successful performance due to the high-intensity acceleration and repetitive contact phases which are all followed with incomplete recovery (Duthie, Pyne & Hooper, 2003)**.** The 30:15 has good reliability for meromorphically built rugby players (Scott et al, 2015) and the Bronco Test is a 5-min field test which can be easily applied (Miles et al., 2019). It would be expected that individuals who are successful in selection at regional levels to have a highly developed aerobic capacity than club players. Additionally, the isometric midthigh pull (IMTP) assesses the whole-body skeletal muscle function through two primary applications: it quantifies maximal peak force and the rate of force development. It has been reported by West et al (2011)) that IMPT relates to performance variables such as countermovement jump height and 10m sprint time. Wang et al (2016) used IMTP on rugby union players and found it correlates with 1RM back squat and 5m sprint time. Additionally, it has relations to strength, vertical jump, and agility (Nuzzo et al,

2008; Beckham et al, 2013). The positive advantages of utilising the IMPT during performance testing at a time constrained youth talent camp is it is easily administered and requires minimal skill requirement (Miller, 2012).

Conclusion

Talent identification programmes are prevalent amongst rugby development pathways and numerous studies have identified the key physical and performance determinants of successful selection. Yet this study is amongst the first to report the psychological and physiological differences between regional and club age grade rugby union players. As playing level increases, regional players were taller, heavier, faster, stronger, produced a greater momentum, and power than club players. Furthermore, regional players scored higher in perfectionistic strivings, achievement motivation and optimism. These results reinforce findings from previous research highlighting the key differences between playing levels in physical characteristics and presented new information towards psychological profiling in talent identification. The differences between regional and club players could be due to increased strength training, size requirement and match demands within the game, however examining the physiological and psychological advantages (and disadvantages) of relative age effect during talent identification could further identify the differences between playing standards.

EXPERIMENTAL CHAPTER 2

The Relative Age Effect on psychological and physiological factors in age grade rugby union

Abstract

Relative age effect provides a greater probability of being identified in talent identification and development programmes for relatively older players because of the physiological advantage from early maturation. Selection bias has been expressed in rugby union before, due to the physical nature of the game were early development has been misconstrued for advanced fitness capabilities, but research in regards to the impact relative age has on psychological factors is scarce. The aim of the study was to examine the existence of relative age effect and the physiological and psychological differences between playing level and age grade categories that arise due to birth distribution in age grade rugby union. A total of 259, age grade rugby union players (Under 16 age: 15.0 ± 0.4 years, range 14.7 -17.0 years; Under 18 age: 16.5 ± 0.6 years, range 15.01 – 18.0 years; Elite Under18s age: 16.8 ± 0.6 years, range 15.11-17.5 years) were divided into playing standards and birth distributions. Data collected from talent camps revealed an overrepresentation of older players compared to younger players in age grade rugby union (Q1 = 33.5%, Q2 = 21.6%, Q3 = 27.8% and Q4 = 17.1%; p = 0.020). Relatively younger regional players were heavier (p-value range = 0.014-0.044) and had a greater momentum (p-value range = 0.026-0.044) than their younger club counterparts and both relatively older and younger regional players power output (p-value range = 0.000-0.043) were greater than their club counterparts in regards to relative age. In the elite under 18s relatively younger players showed favourable psychological characteristics for performance, and older elite players showed signs of burnout (p-value range = 0.001-0.050). In conclusion, mental skills programmes within training may help aid and support player's ability to cope with negative experiences such as failure, deselection, and the feelings of reduce sense of accomplishment to avoid withdrawal and psychological meltdowns.

Introduction

Birth date plays an influential role in the talent identification process (Lewis, Morgan, & Cooper, 2015) due to the variation in chronological age that exists between players of the same competitive age group (Romann & Cobley, 2015; Cumming et al, 2018). A one-year age gap can affect physical, performance and psychological differences to a large scale when subjects are born earlier within an age group (Figueiredo et al.2019; Ek, et al., 2020; Doncaster et al., 2020; Rubajczyk & Rokita, 2020). Older players, reap the physiological and psychological advantages of early maturation and have greater probability of being identified in talent identification and development programmes (Cobley, Baker, Wattie, & Mckenna, 2009; Petrez- Gonzalez et al., 2020) because a greater physical dominance offers a competitive advantage (Bailey et al., 2010; Christensen, Pedersen, & Position, 2008). Younger players will likely need to develop exceptional; physical, technical, and tactical skills to continue within the development pathway (Edgar & O'Donoghue, 2005; Costa, Albuquerque & Garganta, 2012; Cobley & Till, 2015; Figueiredo et al, 2019). However, younger players have previously failed to advance to higher performance levels even when more skilled and motivated than their older counterparts (Zuber, Zibung, & Conzelmann, 2016), suggesting that younger players are considerably overlooked, and denied developmental opportunities (Cobley, 2016).

Specifically, within rugby union, given the nature of the desirable physical characteristics (e.g., height, weight, power, strength, and momentum), relative age effect is more prominent amongst older players and forward positions (Lovell et al, 2015; Kearney, 2017; Kelly et al, 2021). Relative age differentiates older players from the younger players by superior height and weight which is typically seen amongst older players (Deprez et al., 2012, & 2013., Gil et al., 2014; Lovell et al., 2015). Furthermore, relative age affects the physical performance of players, with older players outperforming younger players in strength and power assessments (Figueiredo et al., 2019). The latter is contradicted by Skorski et al (2016) and Patel et al, (2020) stating there are no observed anthropometrical or performance differences variations or consistent trends amongst birth quartiles. However, anthropometric, and physical performance of elite youths are typically similar between birth quartiles (Deprez et al, 2012; Lovell et al, 2015) with the fourth quartile on average presenting

the poorest physical performance results (Figueiredo et al, 2019).

Within an educational and sporting context, younger individuals are associated with a stronger psychological profiles than their older corresponding counterparts (Hauck & Finch, 1993; McCarthy, Collins, & Court, 2016) due to younger individuals being associated with overcoming obstacles and challenges in their development stages (Diamond, 1983). Younger individuals tend to work harder to compete with older individuals, which results in younger individuals acquiring a superior performance in adulthood due to higher levels of determination, perseverance, and motivation (Russell & Startup, 1986; May & Welch, 1986). This psychological outcome is interesting as the current perspectives state older players might gain a psychological benefit (i.e., increased self-esteem (Fenzel, 1992), perceived sport competence (Guillet et al., 2002) due to increased enjoyment towards physical activity because of their performance advantages (Kawata et al., 2017). Jones et al., (2018) suggests younger players overcoming adversity within the development pathway are more likely to be represented at elite level because younger players have a less enjoyable experience having to train against greater physical statures and being dropped and reselected. However, younger players develop a psychological resilience and toughness through the hardship which prepares them for elite training (MacNamara et al., 2010).

Whilst birth distribution is present in younger athletes it becomes less apparent at senior level (Till, Cobley, Wattie, O'Hara, 2010), because players born in the second half of the selection year tend to catch up and tend to even outperform players born in the first half of the selection year (Edgar & O'Donoghue, 2005; Gibbs et al., 2012; Ostojic et al, 2014; Jones, et al., 2018). The 'reversal advantage' has previously been recognised in rugby union academy systems, where relatively younger players were more likely to transition to senior elite status (McCarthy & Collins, 2014; McCarthy et al, 2016). This aligns with the 'underdog hypothesis' where younger players benefit from being exposed to more physical, technical, and experienced older players (Gibbs, Jarvis & Dufur, 2012). The current potentially explanation for the reversal of relative age effect in sports is younger players develop psychological attributes such as increased motivation, determination, resilience, and mental toughness during the development stages (Herbison et al., 2019). Lemoyne and colleagues (2021) continue to support the notion that the reversal effect occurs due to psychological advantages where

younger players develop a psychological capacity to overcome adversity despite not finding differences in adolescent hockey players attitudes towards sports and hockey in the presence of relative age. However, they conclude that younger players who were successful during the selection process have similar psychosocial profiles to older players (Lemoyne et al., 2021). Therefore, the research continues to find evidence that the reversal effect of relative age occurs due to younger players developing a psychological advantage over older players (McCarthy et al., 2016; Jones et al., 2018)

In rugby union, relative age effect begins to appear from as early as Under 7s (Till, et al., 2010) as rugby is considered a popular male team sport which is highly competitive for places (Lewis, Morgan, & Cooper, 2015) however there is lack of research into relative age effect and its effect on physiological and psychological factors important for sport performance. Especially surrounding the relative age effect on psychological factors in rugby union. Therefore, the aim of this study is to establish the existence of relative age effect on birth distribution in regional age grade rugby union and examine the effect relative age has on the psychological and physiological factors. Previous research on the desirable characteristics of soccer players suggests older players are at an advantage during adolescent years but at each successive level, younger players tend to outperform their older counterparts at senior level (Edgar & O'Donoghue, 2005; Cobley, Baker, Wattie & McKenna, 2009; Till, et al., 2010; Romann & Cobley, 2015). We hypothesise older players in the regional age categories will have greater physical and performance attributes than their younger counterparts. In line with the reversal effect, we hypothesise that younger players will display positive training behaviours, personality traits and psychological factors than their older counterparts.

Methods

Participants

The same 259 age grade rugby union players (Under 16 age: 15.0 ± 0.4 years, range 14.7 -17.0 years; Under 18 age: 16.5 ± 0.6 years, range 15.01 – 18.0 years; Elite Under18s age: 16.8 ± 0.6 years, range 15.11-17.5 years) from study one was used for the second study (see Page 21 Chapter 1 for details). Players were separated by playing level (i.e., regional and club), age category (e.g., under 16s

and under 18s), and further subdivided by birthdate distribution (i.e., Half-Year 1 and Half-Year 2) and birth quartiles (i.e., quartile1, 2, 3, and 4; see table 5).

Design

Following ethical approval and parental consent, players provided their date of birth to measure the relative age in regional age grade rugby union in North Wales. Birthdates were categorised into relative age quartiles: quartile 1 (Q1) = September 1st to November 30th; quartile 2 (Q2) = December 1st to February 28th/29th; quartile 3 (Q3) = March 1st to May 31st; quartile 4 (Q4) = June 1st to August 31st and half-year birth distributions: First half of the year (H1) = September 1st to February 28th/29th and second half of the year (H2) = March 1st to August 31st.

Procedure

The data collected on anthropometric, performance and psychological factors were recorded and measured at the talent camps. The same measures from study 1 were used for study 2 (see page 24, Chapter 1 for further details on the procedure).

Statistical Analysis

All statistical analysis was calculated using IBM SPSS version 25.0. A chi-squared test of association was used to analyse whether relative age effect occurs in regional age grade rugby union. To support the chi-squared test, the odds ratio test (OR) was used to compare the odds that an outcome (selection bias) occurs due to a particular exposure (relative age effect). (i.e., the odds of a player born in Q1, Q2, or Q3 being selected over a player born in Q4; Lewis Morgan, & Copper, 2015). An odds ratio greater than 1 suggests that relative age effect (exposure) is a particular risk factor towards selection bias (outcome). A two-way multivariate analysis of variance (MANOVA) was used to report significant differences in anthropometric measurements, physical performance assessments and questionnaire responses of each player from different birth distributions. Birth dates were grouped as half year birth distributions. Descriptive results were reported as means and standard deviations (Mean ± SD) for each playing level (i.e., regional and club), age category (e.g., under 16s, under 18s and elite under 18s) and playing position (i.e., forwards and backs). Shapiro-Wilk test (Wilks' $\Lambda = p < 0.05$) examined the assumptions of normality for all variables. If statistical

289 significance were observed between groups, the Bonferroni within group post hoc comparison test
290 would indicate a significant mean score variation.
291

292

Table 5: Participant Distribution for Study Two

Total Participants (*n*)	**Age Grade** 259																																							
Age Grade Categories (*n*)	**Under 16s** 146																**Under 18s** 113																							
Selection Groups (*n*)	**Regional Under 16s** 80								**Club Under 16s** 66								**Regional Under 18s** 49								**Club Under 18s** 33								**Elite Under 18s** 31							
Positional Groups (*n*)	**Forwards** 44				**Backs** 36				**Forwards** 35				**Backs** 31				**Forwards** 26				**Backs** 23				**Forwards** 12				**Backs** 21				**Forwards** 19				**Backs** 11			
Birth Date Distribution (*n*)	**H1** 28		**H2** 16		**H1** 22		**H2** 14		**H1** 19		**H2** 16		**H1** 13		**H2** 18		**H1** 16		**H2** 10		**H1** 9		**H2** 14		**H1** 10		**H2** 2		**H1** 10		**H2** 11		**H1** 15		**H2** 4		**H1** 5		**H2** 7	
Birth Quartiles (*n*)	**1** 16	**2** 12	**3** 6	**4** 10	**1** 11	**2** 11	**3** 10	**4** 4	**1** 10	**2** 9	**3** 11	**4** 5	**1** 11	**2** 2	**3** 10	**4** 8	**1** 12	**2** 4	**3** 7	**4** 3	**1** 4	**2** 5	**3** 11	**4** 3	**1** 6	**2** 4	**3** 2	**4** 0	**1** 8	**2** 2	**3** 5	**4** 6	**1** 8	**2** 7	**3** 1	**4** 3	**1** 4	**2** 1	**3** 4	**4** 3

Key: n = Number of Participants. Under 16s, Under 18s = Under 16s etc; H1 = Players born in the first 6 months of the Season "September – February". H2 = Players born in the second half of the Season "March – August"; Birth Quartiles 1-4: Quartile 1 = September 1st to November 30th; Quartile 2 = December 1st to February 28th/29th; Quartile 3 = March 1st to May 31st; Quartile 4 = June 1st to August 31st.

Results

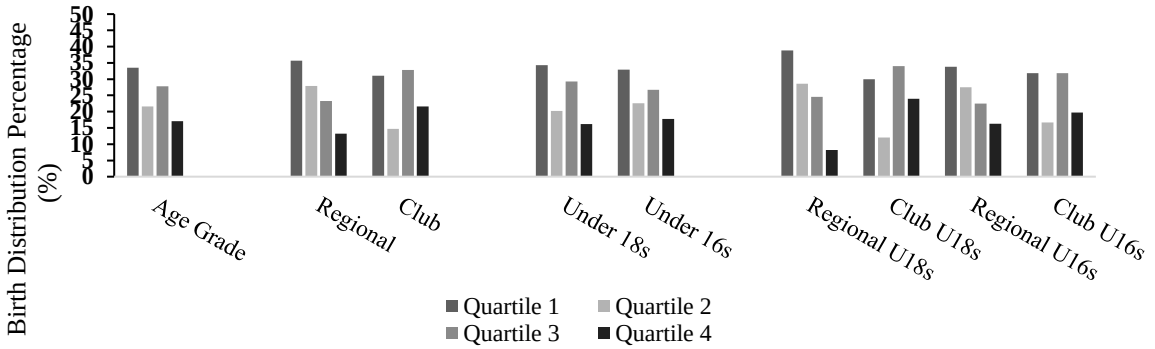
Relative Age Effect

Of the 259 players present at the talent camps, 55.1% were born in the first half of the competitive year (Q1 & Q2), and the least represented quartile was Q4. The birth distribution for age grade rugby union players was: Q1 = 33.5%, Q2 = 21.6%, Q3 = 27.8% and Q4 = 17.1% (See Figure 1). The association between age grade rugby union and relative age effect exists ($X_2 = 9.834$, df = 3, $p = 0.020$) and the strength of the association was moderately weak (Cramer's V = .200, $p = 0.020$). A similar trend was observed between the under 18s cohort and relative age ($X_2 = 8.523$, df = 3, $p = 0.036$) the birth distribution was: Q1 = 34.3%, Q2 = 20.2%, Q3 = 29.3% and Q4 = 16.2% (See Figure 1) and the strength of the association was moderately weak (Cramer's V = .293, $p = 0.036$).

Positionally, the age grade backs had an association with relative age ($X_2 = 11.410$, df = 3, $p = 0.010$) and the birth distribution was: Q1 = 32.4%, Q2 = 19%, Q3 = 30.5& and Q4 = 18.1%, (See Figure 3) and the strength of the association was weak (Cramer's V = .330, $p = 0.010$). This trend was most prevalent amongst the under 16s backs ($X_2 = 8.292$, df = 3, $p = 0.040$) and the birth distribution was: Q1 = 33.3%, Q2 = 19.7%, Q3 = 30.3% and Q4 = 16.7%, (See Figure 3) the strength of the association between under 16s backs and relative age effect was weak (Cramer's V = .354, $p = 0.040$).

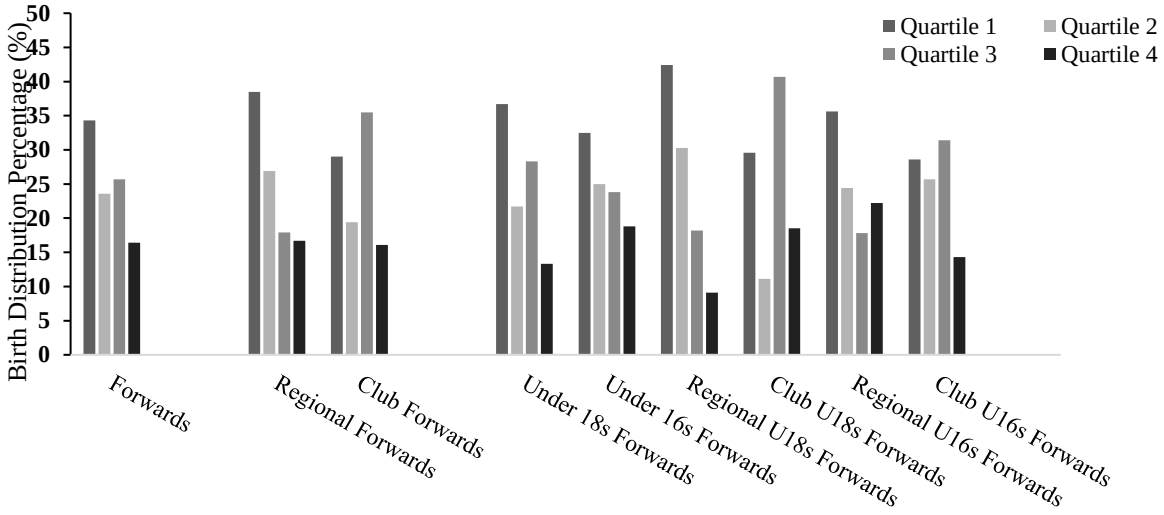
The odds ratio statistics was used to determine the risk of relative age in age grade rugby union. All age groups and backs players born in Q1, Q2 and Q3 were over-represented compared to those in Q4 (e.g., under 16s backs born in Q2 were 14.7 times more likely to be selected over Q4 players; See table 5). Unfortunately, this study was unsuccessful in differentiating the prevalence of relative age effect in regional and club players as the expected value was below 5 in same birth quartiles, resulting in the analysis being violated.

Figure 2: Relative age effect amongst age grade rugby union players



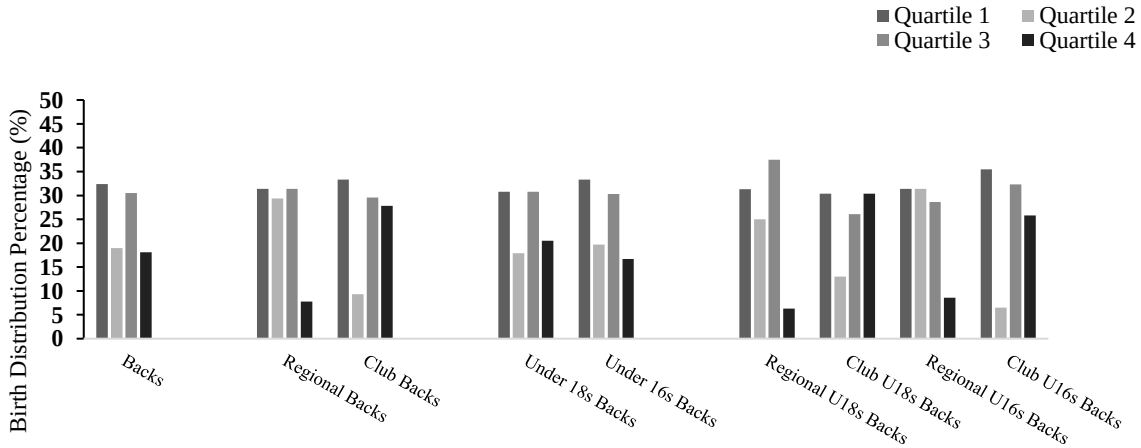
316

Figure 3: Relative age effect amongst age grade forwards in rugby union



317

Figure 4: Relative age effect amongst age grade backs in rugby union



318

Table 6: The odds ratio of relative age effect on playing levels in age grade rugby union.

	OR Q1 vs Q4	95% CI Q1 vs Q4	OR Q2 vs Q4	95% CI Q2 vs Q4	OR Q3 vs Q4	95% CI Q3 vs Q4
Age Grade	1.9	0.883 to 3.997	3.1	1.339 to 7.242	1.2	0.532 to 2.533
Under 16s	1.3	0.494 to 3.348	2.0	0.696 to 5.749	2.1	0.548 to 8.181
Under 18s	3.8	1.017 to 14.205	7.0	1.591 to 30.800	0.86	0.317 to 2.315
Backs	3.3	0.915 to 12.137	11.3	2.518 to 50.265	3.8	1.019 to 13.795
Under 16s Backs	2.7	0.556 to 12.794	14.7	1.970 to 109.204	2.7	0.544 to 13.080
Under 18s Backs	5.0	0.459 to 54.513	9.3	0.711 to 122.570	7.0	0.647 to 75.735
Forwards	1.3	0.467 to 3.522	1.4	0.454 to 3.994	0.49	0.169 to 1.416
Under 16s Forwards	0.80	0.211 to 3.034	0.61	0.152 to 2.450	0.36	0.089 to 1.486
Under 18s Forwards	2.9	0.547 to 15.561	5.6	0.809 to 38.161	0.91	0.159 to 5.195

Key: Q1 – Q4 = quartiles 1 to 4. OR = Odds Ratio. CI = 95% Confidence Interval for OR

Relative age and Anthropometrics Measures

In the under 16s, younger regional players born in the second half of the selection year were taller and heavier than their younger club counterparts (See Table 7 below). A similar trend was observed between the under 18s younger regional and club players, where younger regional players were heavier than their younger club counter parts (See appendices for further details; Table 6)

Table 7: Significant results for relative age effect and anthropometric differences between regional and club players

	Regional H1	Regional H2	Club H1	Club H2	Regional (H1 vs H2)	Club (H1 vs H2)	Regional vs Club (H1 vs H1)	Regional vs Club (H2 vs H2)
Under 16s								
Height (cm)	177.4 ± 5.8	175.49 ± 7.6	174.8 ± 6.5	172.8 ± 7.4	0.915	0.643	0.703	**0.035****
Weight (kg)	75.9 ± 11.8	76.2 ± 18.3	73.4 ± 14.1	67.4 ± 12.5	0.985	0.303	0.908	**0.044****
Under 18s								
Weight (kg)	84.3 ± 10.4	82.9 ± 16.0	80.5 ± 11.9	75.4 ± 9.6	0.979	0.539	0.738	**0.014****

Key: Sig. = *p*-value <.005; ** Statistically Significant; ± = Mean & Standard Deviation.

Relative age and Physical Performance Measures

In the under 16s, older regional players born in the first half of the selection years have a greater jump height and were faster over 10m then younger regional players. Additionally, older regional players were faster over 40m, generate more power over 40m and were faster in both dominant and non-dominant legs than their older club counterparts who were also born in the first half of the selection year (See Table 8 below). Amongst the younger under 16s, younger regional players

generated more momentum and power over 40m than their younger corresponding club counterparts. A similar trend was observed amongst the under 16s forwards and under 18s players (See Table 8 below), with younger regional forwards and younger regional under 18s having a greater momentum and power over 40m than their younger club counterparts. With the elite under 18s, younger and older regional players have a greater peak anaerobic power in the countermovement jump than under 18s (See Table 8). This was further observed amongst the forwards and backs, with younger and older elite forwards and backs generating a greater peak anaerobic power output in the countermovement jump than the under 18s cohort. Additionally, the younger elite backs have a greater non-dominant hand grip strength than the younger under 18s cohort (See Table 8 below).

Table 8: Significant results for **r**elative age effect on the physical performance measure in age grade rugby union

AGE GRADE	**Regional H1**	**Regional H2**	**Club H1**	**Club H2**	**Regional (H1 vs H2)**	**Club (H1 vs H2)**	**Regional vs Club (H1 vs H1)**	**Regional vs Club (H2 vs H2)**
Under 16s								
CMJ (cm)	49.3 ± 6.7	45.2 ± 6.5	46.9 ± 7.0	45.5 ± 5.7	**0.035****	0.928	0.306	0.829
10m Sprint (s)	1.78 ± 0.07	1.85 ± 0.16	1.82 ± 0.10	1.86 ± 0.10	**0.028****	0.609	0.355	0.999
40m Sprint (s)	5.56 ± 0.28	5.75 ± 0.40	5.82 ± 0.42	5.83 ± 0.36	0.076	1.000	**0.009****	0.900
Momentum (m/s. kg)	545 ± 78.9	532 ± 115.6	504 ± 82.2	463 ± 80.4	0.628	0.244	0.130	**0.026****
Agility DL (s)	8.51 ± 0.36	8.54 ± 0.36	8.87 ± 0.45	8.52 ± 0.34	0.994	0.092	**0.023****	0.999
Agility NDL (s)	8.64 ± 0.39	8.70 ± 0.42	9.03 ± 0.44	8.75 ± 0.42	0.972	0.291	**0.023****	0.991
Power (w)	1600 ± 265.8	1632 ± 316.2	4943 ± 811.3	4539 ± 788.3	0.992	1.000	**0.021****	**0.022****
Under 18s								
Momentum (m/s. kg)	615 ± 60.3	612 ± 100.7	562 ± 73.6	535 ± 58.6	1.000	0.803	0.510	**0.044****
Power (w)	6023 ± 590.7	5999 ± 986.6	5508 ± 720.1	5230 ± 573.3	1.000	0.802	0.174	**0.043****
Elite U18s								
PAP (w)	7246 ± 398.7	6974 ± 425.8	4841 ± 417.8	4700 ± 662.3	0.510	0.630	**0.000****	**0.000****
FORWARDS	**Regional H1**	**Regional H2**	**Club H1**	**Club H2**	**Regional (H1 vs H2)**	**Club (H1 vs H2)**	**Regional vs Club (H2 vs H2)**	**Regional vs Club (H2 vs H2)**
Under 16s								
Momentum (m/s. kg)	572 ± 70.4	586 ± 118.6	511.2 ± 95.6	497 ± 67.0	0.964	0.964	0.103	**0.032****
Power (w)	5609 ± 689.6	5750 ± 1161.6	5009 ± 936.0	4866 ± 657.2	0.964	0.964	0.103	**0.031****
Elite U18s								
PAP (w)	7329 ± 419.7	7097 ± 691.5	4895 ± 376.4	5175 ± 869.9	0.900	0.478	**0.000****	**0.000****
BACKS	**Regional H1**	**Regional H2**	**Club H1**	**Club H2**	**Regional (H1 vs H2)**	**Club (H1 vs H2)**	**Regional vs Club (H2 vs H2)**	**Regional vs Club (H2 vs H2)**
Elite U18s								
GS-NDH (kg)	43.3 ± 5.9	50.5 ± 5.0	42.8 ± 4.7	42.3 ± 4.7	0.903	0.972	0.997	**0.006****
PAP (w)	6980 ± 134.3	6898 ± 288.1	4687 ± 395.9	4535 ± 476.0	0.988	0.681	**0.000****	**0.000****

Key: Sig. = *p*-value <.005; ** Statistically Significant; ± = Mean & Standard Deviation; CMJ = Countermovement Jump; DL = Dominant Leg; NDL = Non-Dominant Leg; PAP = Peak Anaerobic Power; GS-NDH = Grip Strength Non-Dominant Hand.

Relative age and psychological assessment

In the under 16s, regional players born in the first half of the selection year score higher in *Self-Esteem* than regional players born in the second half of the selection year (see table 9 below), this trend was also observed amongst regional backs, with older regional backs scoring higher than younger regional backs and older club backs in *Self-Esteem.* A similar trend was observed between

under 16s younger regional and club players, with younger club players scoring higher in *Self-Esteem* than younger regional players, this was further observed between under 16s regional and club forwards, were the club forwards scored higher in *Self-Esteem* than younger regional forwards (See Table 9 below). *Conscientiousness* is higher amongst younger regional player than older regional players and this trend was observed amongst regional backs. Additionally, younger regional players were more *agreeable* than younger club players and older club players *appraisal of others emotions* were greater than older regional players.

Table 9: Significant results for **r**elative age effect on the psychological factors in under 16s rugby union

UNDER 16s	**Regional H1**	**Regional H2**	**Club H1**	**Club H2**	**Regional (H1 vs H2)**	**Club (H1 vs H2)**	**Regional vs Club (H1 vs H1)**	**Regional vs Club (H2 vs H2)**
Self-Esteem	14.5 ± 2.3	12.7 ± 3.0	13.3 ± 1.5	14.2 ± 2.2	**0.005****	0.340	0.114	**0.037****
Conscientiousness	8.8 ± 2.6	10.5 ± 2.3	9.3 ± 2.4	9.8 ± 2.1	**0.012****	0.905	0.654	0.673
Agreeableness	9.1 ± 1.9	9.6 ± 1.9	9.3 ± 1.9	8.3 ± 1.9	0.609	0.133	0.956	**0.029****
AOE	7.6 ± 1.4	7.5 ± 1.1	8.2 ± 1.1	7.1 ± 1.3	0.999	**0.043****	0.400	0.739
Forwards								
Self-Esteem	14.0 ± 2.3	12.4 ± 3.6	13.5 ± 1.6	14.7 ± 2.3	0.166	0.516	0.918	**0.049****
Backs								
Self-Esteem	15.0 ± 2.3	13.0 ± 2.2	12.9 ± 1.3	13.8 ± 2.1	**0.027****	0.625	**0.024****	0.673
Conscientiousness	8.3 ± 2.3	10.8 ± 2.1	9.4 ± 2.7	9.5 ± 1.9	**0.012****	1.000	0.438	0.415

Key: Sig. = *p*-value <.005; ** Statistically Significant; ± = Mean & Standard Deviation. AOE = Appraisal of Others Emotions

In the under 18s, younger club players scored higher in *Sport Devaluation* than younger regional players. Additionally, younger club players scored lower in *Outcome* and *Mastery Focus* in comparison to older club players and younger regional players. Furthermore, younger club players scored higher in *Conscientiousness* than older club players and scored higher in *Agreeableness* (than their younger regional counterparts (See table 10 below). Positionally, regional forwards born in the first half of the selection year, scored higher in *Integrated Regulation* and *Coachability* than their younger regional counterparts. Additionally, younger club backs scored higher in *Freedom from Worry*, than younger regional backs (See table 10 below).

Table 10: Significant results for relative age effect on the psychological factors in under 18s rugby union

UNDER 18s	**Regional H1**	**Regional H2**	**Club H1**	**Club H2**	**Regional (H1 vs H2)**	**Club (H1 vs H2)**	**Regional vs Club (H1 vs H1)**	**Regional vs Club (H2 vs H2)**
Sport Devaluation	8.6 ± 2.7	7.5 ± 2.2	8.6 ± 2.4	10.6 ± 3.6	0.528	0.136	1.000	**0.006****
Outcome Focus	8.4 ± 1.4	8.7 ± 1.2	9.1 ± 1.1	7.5 ± 1.9	0.882	**0.009****	0.428	**0.048****
Mastery Focus	8.8 ± 1.2	9.3 ± 0.94	9.4 ± 0.81	8.1 ± 1.4	0.559	**0.009****	0.413	**0.009****
Agreeableness	9.1 ± 1.4	8.7 ± 1.7	9.1 ± 2.1	10.5 ± 1.8	0.834	0.138	1.000	**0.020****
Conscientiousness	9.5 ± 2.8	8.9 ± 2.1	7.6 ± 2.1	10.1 ± 2.8	0.831	**0.028****	0.064	0.485
Integrated Reg.	11.1 ± 2.3	8.7 ± 2.6	11.6 ± 1.7	11.4 ± 2.4	0.119	1.000	1.000	0.121
Coachability	5.5 ± 0.97	4.4 ± 1.1	5.5 ± 1.0	5.0 ± 1.2	0.242	1.000	1.000	1.000
Free from Worry	2.7 ± 1.6	2.7 ± .87	2.8 ± 1.3	4.0 ± 0.82	0.672	0.868	0.113	0.363
Forwards								
Integrated Reg.	11.9 ± 1.8	8.5 ± 2.6	11.0 ± 2.0	N/A	**0.029****	N/A	0.821	N/A
Coachability	5.3 ± 1.1	3.5 ± 0.58	5.3 ± 1.2	N/A	**0.040****	N/A	0.997	N/A
Backs								
Free from Worry	2.0 ± 1.7	2.8 ± 0.84	N/A	4.3 ±0.50	0.558	N/A	N/A	**0.045****

Key: Sig. = *p*-value <.005; ** Statistically Significant; ± = Mean & Standard Deviation; N/A = No available data

In the elite under 18s, older elite players score higher in the following factors: *Athlete Burnout* and *Reduce Sense of Accomplishment* than younger elite players (See Table 11 below). A similar trend was observed between elite players and the under 18s cohort born in the second half of the selection year, the younger under 18s players scored higher in *athlete burnout* and *reduce sense of accomplishment* than their younger elite counterparts. Additionally, older elite backs scored higher in *Athlete Burnout, Reduce Sense of Accomplishment,* and *Training Stress*. Whereas younger elite players scored higher in *extraversion*, *emotional stability*, and *openness to new experiences* than older elite players. Additionally, younger elite forwards also scored higher in *emotional stability* than older elite forwards. Moreover, younger elite backs scored higher in *extraversion*, *openness,* and *commitment* than older elite backs. Additionally, younger elite players and younger elite forwards were more *extraverted* than their younger corresponding counterparts. Amongst the older cohort, it was observed that older elite forwards scored higher in *perfectionistic strivings* than younger under 18s forwards, whereas older under 18s backs were more *coachable* than the older elite backs (See Table 11 below)

Table 11: Significant results for relative age effect on the psychological factors in elite under 18s rugby union

ELITE U18s	Elite H1	Elite H2	U18s H1	U18s H2	Elite (H1 vs H2)	U18s (H1 vs H2)	Elite vs U18s (H1 vs H1)	Elite vs U18s (H2 vs H2)
Athlete Burnout	33.6 ± 4.9	26.9 ± 5.1	30.5 ± 7.0	33.6 ± 7.1	**0.038****	0.170	0.297	**0.021****
RA	14.0 ± 1.9	10.1 ± 2.0	12.8 ± 2.8	12.9 ± 2.9	**0.001****	0.999	0.330	**0.016****
Extraversion	8.6 ± 1.8	10.7 ± 1.5	9.0 ± 2.0	8.9 ± 1.9	**0.018****	1.000	0.904	**0.034****
Emotional Stab.	8.4 ± 2.3	11.5 ± 1.8	8.6 ± 1.9	9.6 ± 2.5	**0.001****	0.206	0.959	0.052
Openness	9.2 ± 2.0	11.1 ± 2.0	9.0 ± 1.8	9.5 ± 2.1	**0.045****	0.774	0.997	0.082
Perf. Strivings	7.2 ± 1.3	6.9 ± 1.1	6.6 ± 1.2	6.2 ± 1.4	0.907	0.586	0.191	0.461
Commitment	7.8 ± 1.4	8.4 ± 0.67	7.7 ± 1.2	7.5 ± 1.1	0.284	0.794	0.954	0.144
Coachability	4.5 ± 0.93	4.3 ± 0.50	5.5 ± 0.97	4.7 ± 1.1	0.985	0.224	0.081	0.843
Forwards								
Extraversion	9.1 ± 1.9	11.5 ± 1.7	9.0 ± 2.3	8.9 ± 2.0	0.182	0.823	0.993	**0.044****
Emotional Stab.	8.4 ± 2.7	12.3 ± 0.96	9.1 ± 2.1	9.9 ± 2.4	**0.023****	0.733	0.826	0.292
Perf. Strivings	7.4 ± 1.2	6.0 ± 1.0	6.4 ± 1.2	6.3 ± 0.79	0.208	0.995	**0.025****	0.983
Backs								
Athlete Burnout	37.4 ± 4.4	27.0 ± 5.6	32.5 ± 6.0	33.3 ± 7.7	**0.050****	0.986	0.607	0.137
RA	14.4 ± 2.1	10.1 ± 1.9	13.6 ± 2.2	12.5 ± 3.1	**0.033****	0.402	0.929	0.168
Training Stress	10.0 ± 3.3	8.3 ± 1.5	7.3 ± 2.1	7.1 ± 2.0	0.537	0.999	**0.047****	0.613
Extraversion	7.3 ± 0.82	10.3 ± 1.3	9.1 ± 1.5	9.2 ± 2.2	**0.019****	0.998	0.172	0.439
Openness	8.0 ± 1.4	11.6 ± 0.98	8.9 ± 1.7	9.6 ± 1.7	**0.005****	0.710	0.705	0.063
Commitment	7.0 ± 1.4	8.7 ± 0.49	7.9 ± 1.3	7.7 ± 0.96	**0.042****	0.840	0.315	0.119
Coachability	4.3 ± 0.58	4.0 ± 0.00	6.0 ± 0.00	5.1 ± 0.93	0.958	0.229	**0.044****	0.258

Key: Sig. = *p*-value <.005; ** Statistically Significant; ± = Mean & Standard Deviation; N/A = No available data

Discussion

The aim of the present study was to examine the existence of relative age effect and the physiological and psychological differences between playing level and age grade categories that arise due to birth distribution in age grade rugby union. The main findings revealed an overrepresentation of older players compared to younger players in age grade rugby union as a whole. Relatively older and younger regional players were taller, heavier, and performed better in physical performance tests in particularly in power over 40m than their corresponding club counterparts. Whereas, in the elite under 18s age category relatively younger players showed favourable psychological characteristics for performance than relatively older elite under 18s.

Relative age effect exists amongst North Wales age grade rugby union players, and was predominantly seen in the back's positions, in particularly the under 16s backs. Playing positions influence the relative age effect in rugby union (Till et al, 2010; Kearney, 2017). Jones, Lawrence, and Hardy (2018) presented evidence that older players are overrepresented in comparison to younger players amongst back positions in international rugby union. Furthermore, Kelly et al (2021) explored birth distributions amongst the English male rugby union player pathway and revealed an overrepresentation of older players (i.e., Q1 and Q2 or H1) in the youth cohorts (e.g., U15s regional Academy and Under 16s-23 England Academy) than younger players (i.e., Q4 or H2). Both studies

present similar findings to this study, which suggest relative age effect is an issue for rugby union youth development programmes. However, Kelly and colleagues (2021) further presented no difference in the birth distribution in the senior cohorts (e.g., Senior Professional and Senior International), suggesting relative age is eradicated at professional level and older players do not have an advantage over relatively younger players (Vaeyens et al., 2005; Cobley, Baker et al., 2009).

In the regional under 16s, relatively older players born in the first half of the selection year have a more optimal jump height and were faster over 10m than their relatively younger regional counterparts. However, anthropometric and performance differences between relatively older and younger players in age grade rugby is not as protruding in this study as previous studies suggested; where relatively older players were taller and heavier (Till, et al., 2010; Deprez et al., 2012, & 2013., Gil et al., 2014; Lovell et al., 2015) and superior in strength and power assessments (Lidor, et al., 2010; Figueiredo et al., 2019). The anthropometric and performance measures of regional players in regards to relative age was relatively similar, if not identical. In the regional under 16s, younger players were taller and heavier than their younger club counterparts, whereas there were no differences between older and younger regional players in the under 16s. Younger players selected for regional representation were likely selected due to possessing similar physical and anthropometric characteristics to relatively older players (Till et al., 2010). With only a couple of performance factors differentiating between relatively younger and older players, this study supports the notion that there is no performance variation amongst birth distribution in the player pathway (Skorski et al., 2016; Patel et al., 2020). However, we support the notion of a selection bias, as there is a considerable variation in performance and physical characteristics presented in this study between regional and club players in regards to relative age. Performance measures between regional and club players were superior amongst regional players: relatively older regional under 16s players were faster over 40m, generated more power in the 40m sprint and were considerably faster in the agility trials than relatively older club players. Additionally, relatively younger regional under 16s players generate more momentum and power in 40m sprint than club players of the same birth distribution. A similar trend was observed in younger regional under 18s and forwards positions. Furthermore, younger, and older elite players were superior in explosive lower limb peak anaerobic power than their under 18s

418 counterparts. Regional players were outperforming their club counterparts in both older and younger
419 birth distributions, thus suggesting a bias towards identifying and selecting players based on advanced
420 performance capabilities which are desirable for game performance. Selection biases have been
421 expressed in rugby union previously, due to the physical nature of the game were early development
422 has been misconstrued for advanced fitness capabilities (Kelly, et al, 2021; Furely & Memmert, 2016;
423 Till et al, 2013; Armstrong, 1998). Till and colleagues (2010) raised awareness of the problem
424 between the interaction of physical characteristics and selection in regards to relative age effect in the
425 talent identification system. Earlier maturing players are more likely to be selected for representation
426 level because of their superior and advance physical development which diminishes the coach's
427 ability to identify true talented players and could potentially lead to late maturing players to dropout
428 (i.e., In the under 18s, younger club players scored higher in sport devaluation than their regional
429 counterparts; Till et al., 2010). Research have argued the case for other performance components such
430 as technical and psychological skills to be considered in the talent identification and development
431 process over a longitudinal period to improve predictive value. Additionally, Lewis, Morgan, and
432 Cooper (2015) emphasised that future research should consider the relationship of positional relative
433 age effect and physical characteristics due to its association with maturational advantage. In soccer it
434 has been shown by Gonzalez and colleagues (2020) that older players are selected for specific field
435 positions because it is assumed, they possess the anthropometrical and physical performance qualities
436 required for match advantages. Similarly, rugby union is recognised for accommodating a broad range
437 of different morphologies and Kearney (2017) and Till et al (2010) found forwards positions
438 particularly props and locks are at the greatest risk of relative age effect bias due to their body shape.
439 Positional specific demands lead to players presenting greater anthropometric qualities to be
440 designated to a specific positional role leading to a relative age effect being more prevalent amongst
441 the forwards.

442 Relatively older regional players both in the under 16s and under 18s presented greater self-
443 esteem, coachability and integrated regulation scores in the psychological questionnaire comparison
444 to relatively younger regional players. Traits which are considered desirable, because they encompass
445 the players fully integrated motivation and passion towards the game (Rasquinha, Dunn, & Dunn,

2014; Tedesqui & Young, 2018; Cosma et al, 2020; Rodrigues et al, 2020). Older players have positive self-perception as they are more frequently perceived as more talented than their younger counterparts due to being more maturely advanced in performance capabilities which are often referred to as gifted characteristics (Fenzel., 1992; Hancock et al., 2013). However, the tables turn when the psychological result for elite under 18s present older players scoring lower in positive training behaviours such as self-esteem. Instead, relatively older players were scoring higher in the athlete burnout, reduce sense of accomplishment and training stress, whereas the younger elite players who were now scoring significantly higher in extraversion, emotional stability, and openness to new experiences. Relatively younger athletes who remain in the system eventually become advantage in comparison to their relatively older counterparts (Guillich et al, 2019). The greater time spent in the developmental stages (Kirk, 2005) or the competitive and selective nature of talent development has been argued to encourage younger players to developed more optimal motor development, technical, tactical, psychological skills, and traits which are often neglected by older players, as all their focus is on their physicality and not their cognitive understanding of the game (Malina et al., 2015; O'Donoghue & Neil, 2015; Cumming et al., 2018). Relatively younger players have a greater drive to be selected, and noticed (Mann, Dehghansai & Baker, 2017) leading to the development of psychological resilience and toughness through overcoming adversity in the development pathway during formative stages of development (McCarthy et al, 2016; Jones, Lawrence, Hardy, 2018; Cupples, 2021). Jones and colleges (2018) believe that surviving the player development pathway may lead to possessing desirable physical qualities and mindset to succeed at elite level (McCarthy et al, 2016; McCarthy & Collin, 2014).

Relative age effect and burnout susceptibility have previously been to be an issue in talent development programmes because burnout increases the risk of withdrawal from participation (O'Donoghue & Neil, 2015). Burnout is the chronic state of emotional and physical depletion (Maslach, & Jackson, 1981) where players report feeling that they are unable to achieve their goals and are performing below expectations (Cresswell & Eklund, 2003). In female Canadian ice hockey, it is believed that older players (e.g., particularly quartile 2) are at greater risk of injury, burnout, and sport withdrawal due to the intense involvement in the talent identification and development system

from pre-adolesce to adolescence (Smith, Weir, Till, Romann & Cobley, 2018). Interestingly, one of the comments from an adolescent swimmer in Fraser-Thomas and Cote (2009) paper discussed their mental and emotional struggles with failure. Early maturing swimmers perceived themselves as one of the best performers when they were physically more advanced than later maturing swimmers, but when the other swimmers caught-up, it became increasingly more difficult for the early matures to remain on top. Their sense of becoming less accomplished triggered a mental-breakdown (i.e., emotional, and physical exhaustion) due to their incapability to outperform other swimmers (Fraser-Thomas & Cote, 2009). A similar trend was observed in this study were relatively older elite players were scoring higher in athlete burnout and reduce sense of accomplishment, however, there were no performance difference between relatively older and younger elite players to suggest that the athlete burnout was caused by feeling less accomplished due to younger players outperforming older players. Researchers have argued that due to coaches applying a greater focus on older players physicality early on in development it has led to a neglect in their psychological development (O'Donoghue & Neil, 2015). Younger players have benefited from spending a greater time in the developmental stages, they have not only optimised their physical skills but their understanding and cognitive skills for the sport and have become more mentally resilient.

There are limitations to this study, firstly, there were issues with running a successful chi-squared analysis to differentiate regional and club players and the pervasiveness of relative age in each age category. This occurred due to when players were divided into birth quartiles the expected value (i.e., particularly in quartile 4) was below 5, which meant the assumption was violated. Furthermore, there were only thirty-one elite player which was not sufficient to do run a successful chi-squared analysis and odds ratio to confirm if relative age effect was prevalent amongst elite regional academy players. However, numerous studies have previously identified that relative age is reduced towards adulthood and senior level. Secondly, the study was a cross-sectional design, therefore does not present the change over time in psychological characteristics to confidently capture the reversal effect. A longitudinal design could mark when psychological changes begin amongst the age grade players which could help prevent premature dropout, coaches could help support players who are suddenly losing faith in their competency and offer more to those building confidence.

Additionally, developing psychological skills to cope within long-term involvement in the youth player development pathway is crucial to help players deal with transition and setbacks (Edwards & Steyn, 2008; Cupples, 2021).

Conclusion

The results of this chapter highlight the physiological and psychological differences between birth distributions and playing standards in regional age grade rugby union. Relatively older and younger regional players presented a more mature and developed physiological capacities (i.e., height, weight, power, momentum) than club players and at elite level there are more prevalent burnout symptoms amongst older elite under 18s players than relatively younger elite players. Further research is required to support the notion that the reversal effect is encouraged by younger players being more psychological equipped to cope with talent development programmes than relatively older players (Jones et al., 2018). The coach's ability to understand adolescent's psychological development needs to be clearly understood to support players withstand against the hardships of training within a development system (Hill et al., 2015). The talent identification and development pathway should consider implementing psychological skills programmes within training regime to help aid and support young athlete's ability to cope with negative experiences such as failure, deselection, and the feelings of reduce sense of accomplishment to avoid withdrawal and psychological meltdowns (Cupples, 2021).

EXPERIMENTAL CHAPTER 3

Longitudinal examination of relative age and psychological and physiological factors in regional age grade Rugby Union

Abstract

An integral part of talent identification and development programmes is the implementation of psychological and physiological testing protocols, to benchmark a player's development. The purpose of this study was to track eighty-four regional age grade rugby union players over one season, to evaluate the change in anthropometrics, physical performance, and psychological characteristics, in respect to relative age. The psychological and physiological measurements were collected during two consecutive talent camps for two retained regional age groups: (1) retained under 16-17s (Mean age in 2019: 15.2 ± 0.4 years; Mean age in 2020: 16.0 ± 0.4 years) and (2) retained under 17-18s (Mean age in 2019: 16.3 ± 0.3 years; Mean age in 2020: 17.1 ± 0.4 years). The results presented physiological and psychological development over the longitudinal period. Younger players in the retained under 17-18s have greater personality (i.e., Extraversion (p = 0.029), Agreeableness (p = 0.020), Conscientiousness (p = 0.041), Emotional Stability (p = 0.019) and Openness (p = 0.004)) changes which are associated with professional career attainment over the season than relatively older players who developed athlete burnout symptoms (i.e., Exhaustion (p = 0.008) and Sport Devaluation (p = 0.003)) by the end of the season. Results set groundwork towards presenting a psychological evidence for the reversal effect proposed by Jones, Lawrence, and Hardy (2018). It is important to continue to monitor the psychological development of players to be able to pinpoint when relatively younger players begin to develop superior characteristics and to record which traits and states are stable and remain the same throughout the pathway.

Introduction

Talent identification and development programmes are associated with recognising young players with the potential of becoming elite senior players and providing talented individuals with the most appropriate learning environment to nurture their potential (Williams & Reilly, 2000; Till et al., 2015). An integral part of talent identification and development programmes is the implementation of physiological and psychological testing protocols, to benchmark a player's development (Hulse et al, 2013; Till et al., 2015; Faude et al., 2012). Cross-sectional research has differentiated players from those who are retained and released from the system, but findings only provide data on current performances (Gabbett, & Herzig, 2003; Kirkpatrick, & Comfort, 2013; Till et al., 2010; Benner et al., 2019; Castillo et al., 2019; Patel et al., 2020). There is a potential increase in the risk of a false evaluation and bias during selection when decisions are based off current performances (Zoppirolli, et al, 2020; Till & Baker, 2020). Research has suggested that longitudinal observations provide more information to coaches of the expected developmental changes in players performance as they progress at each successive level (Matthys et al., 2013; Till et al., 2015). Differentiating between an athlete's current performance and future potential is complex (Reilly, et al., 2000; Till & Baker, 2020), due to the influence of maturation, trainability, individual characteristics, and sport-specific requirements (Zoppirolli, et al, 2020).

Anthropometric and performance developmental changes are associated with normal growth, maturation adaptions and an increase in testosterone, which occurs predominantly amongst younger age categories (i.e., Under 14-16s; Till, et al., 2017). Lean mass and bone mineral content continue to increase into the early 20s where considerable strength increments are most predominant (Krustrup, et al, 2003; Malina, Bouchard, & Bar-Or, 2004; Philippaerts, et al., 2006; Till, et al., 2011). Early developmental changes are an advantage within chronological age categories (Armstrong, et al., 1998; Cobley, et al., 2009), however, older players born earlier in the selection year are being misconstrued by coaches for future performance potential due to their enhanced growth and fitness capacities (Furley & Memert, 2016). As seen in study 1 and 2 results, older players possess the key characteristics for selection and success in rugby union (i.e., greater stature and mass, a higher intensity and running ability, muscular strength, and power; Delorme, et al., 2009; Owen, et al., 2020;

570 Till, Weakley et al., 2020). However, investigations into the reversal effect in soccer (Kelly et al.,
571 2020) and rugby union (McCarthy et al., 2016; Jones et al., 2018; Kelly et al., 2021) have found
572 younger players born in the fourth quartile are more likely to achieve senior professional and
573 international level than their older counterparts (i.e., quartile 1 & 2). The reversal effect has a
574 psychological explanation of younger players having a stronger psychological profile developed by
575 overcoming adversity and more exacting experiences than older players (Gibbs et al., 2012; McCarthy
576 & Collins, 2014; McCarthy et al., 2016, Jones et al., 2018; Kelly et al., 2021).
577 The full scientific understanding of psychological factors related to long-term development in
578 elite performance is an ongoing process (Vink, & Raudsepp, 2020). Longitudinal psychosocial studies
579 have investigated the long-term impact surrounding players involvement in talent identification and
580 development systems (Rongen, et al., 2020) yet research has only started to consider the impact of
581 relative age effect on long-term psychological development in sport. Current research has concerns
582 regarding the psychological stability of individuals in talent identification and development systems
583 with long-term involvement reporting high and stable levels of self-esteem (Cheval et al., 2017; Adie
584 et al., 2010) and athletic identity (Rongen, et al., 2020) but a decrease in wellbeing, (Noon et al, 2015)
585 and increasing levels of burnout and stress (Balaguer et al., 2012). These studies have raised concerns
586 surrounding long-term academy involvement (i.e., high-perceived stress, burnout, and lowered mood;
587 Rongen, et al., 2020). However, it has been mentioned that younger players become more resilient
588 and mentally tough as they progress through the pathway as they are of training against greater
589 physical statures and are constantly overlooked (MacNamara et al., 2010). Similar findings were
590 observed in African junior soccer players, were late developers were scoring higher in coping with
591 adversity, were more able to goal set and use mental preparation than early developers (Jooste, et al.,
592 2019). Jooste and colleagues (2019) support the notion that psychological factors can potentially
593 counterbalance some of the psychological disadvantages of late maturation and coaches should not
594 exclude younger players from talent development programmes.
595 The previous two chapters reflected the differences between regional and club from one specific
596 time point, whereas a longitudinal approach would be able to monitor player development over time
597 and has been considered the optimal method of appraising the talent development programme (Till et

al., 2015). Testing protocols can be used to create a physical profile, that acts as a guide to implementing short- and long-term targets to ensure youth players are meeting senior standards (Casserly et al., 2019). This study aims to track regional age grade rugby union players over one season, and evaluate the change in anthropometrics, physical performance, and psychological characteristics, with respect to relative age. It was hypothesised that a reversal effect would begin to present itself in anthropometric measurements and physiological performances amongst younger players in both under 16-17s and under 17-18s as they "catch-up" to older, more mature players. In addition, it was hypothesised that players born in the second half of the selection year would present more positive psychological characteristics and training behaviours (i.e., optimism, commitment, athlete identity) than older players in conjunction with the 'underdog theory'.

Method

Participants

A total of 84 players (i.e., in the Under 16s and Under 18s) were successful on two consecutive talent camps (i.e., April 2019 and February 2020) were included in this longitudinal study. The players were divided into two groups and further into subcomponents (e.g., birth distributions; see table 12); (1) retained under 16-17s (Mean age in 2019: 15.2 ± 0.4 years; Mean age in 2020: 16.0 ± 0.4 years) and (2) retained under 17-18s (Mean age in 2019: 16.3 ± 0.3 years; Mean age in 2020: 17.1 ± 0.4 years). Due to insufficient number this study was unable to group birth distributions by positions. Furthermore, due to players having injury at the time, there are greater participation numbers in the psychological questionnaires than there is in physical performance and assessments.

Design

The study was a longitudinal design to measure the changes in the physiological and psychological characteristics of retained regional age grade players and the differences in birth distribution. Selection days were held at RGC training ground (Stadiwn Zip World, Eirias Park, Colwyn Bay) in 2019 and 2020 (i.e., April 2019 and February 2020). Data over one season was collected on; standard anthropometry (e.g., height and weight), physical performance assessments (e.g., speed, agility, strength, and power), psychological factors related to athletic performance.

Table 12: Number of Participants for the Longitudinal Study

Measures	Total	Age Category		Birth Distribution				Positional			
		Retained Under 16s 2019-2020	Retained U17s 2019-2020	Retained Under 16s		Retained Under 17s		Retained Under 16s		Retained Under 17s	
				H1	H2	H1	H2	H1	H2	H1	H2
Anthropometrics	45	30	15	17	13	8	7	-	-	-	-
Physical Performance	45	30	15	17	13	8	7	-	-	-	-
Psychological Assessment	84	55	29	33	22	17	12	30	25	18	11

Key: H1 = Players born in the first 6 months of the Season "September – February". H2 = Players born in the second half of the Season "March – August".

Procedure

The data collected on anthropometric, performance and psychological factors were recorded and measured at both talent camps and used for this study (see page 22, 'Experimental Chapter 1 for further details on the procedure). An additional performance measures was added; aerobic endurance of players: - Players aerobic fitness was measured via the bronco test. The bronco test consists of running 1200m in a shuttle-type manner with cones placed at 0m, 20m, 40m and 60m. Players had to run from 0m to 20m and back, run again, from 0m to 40m and back, and then, from 0m to 60m and back to 0m to complete one shuttle repetition. Five repetitions were required to complete the test as promptly as possible. Time was recorded by video tape, to capture finishing times. Bronco test is widely used in a rugby environment as it is an easy 5-minute field test to apply (Berthon et al., 1997).

Statistical Analysis

Mean and standard deviation scores (Mean ± *SD*) were calculated for all dependent variables according to age category (e.g., retained under 16s-17s and retained under 17-18s) and birth distribution (e.g., H1 = 1st September – 28th/29th February; and H2 = 1st March – 31st August). A repeated measures (ANOVA) was initially conducted to identify significant main effects for each age category between timepoint 1 and timepoint2, for anthropometric changes and physical performance development and psychological differences. Bonferroni pairwise comparisons were then conducted to examine univariate effects between each dependent variable. An additional univariate analysis of variance was conducted to identify the significant differences between birth distributions at each time point. All analyses were conducted with SPSS version 25.0 with significance levels set at $p < 0.05$.

Results

Anthropometrics

In the retained under 16-17s and retained under 17-18s, both older and younger players height and weight increased over the longitudinal period. Additionally, retained under 16-17s older players were taller than relatively younger retained players at timepoint 1 and timepoint 2 (See Table 13 & 14; See Appendices for Percentage Change).

Physical Performance

In the retained under 16-17s and retained under 17-18s, it was observed that older and younger retained players momentum over 40m and grip strength scores in the dominant and non-dominant arms improved over the season. Furthermore, the time to complete the bronco test increased for relatively older and younger players in the retained under 16-17s. A similar trend was observed in the retained under 17-18s were relatively younger retained players bronco time increased from timepoint 1 to timepoint 2. Further changes were observed in the retained under 16-17s, were relatively older players 10m sprint time was slower in timepoint 2 than timepoint 1. Additionally, it was observed in the retained under 16-17s, that relatively younger players power over 40m improved over the season. At timepoint 1 it was observed between the retained under 17-18s that relatively younger players were faster over 10m than relatively older players, however by timepoint 2 there were no difference in 10m sprint time (see table 13 & 14; See Appendices for Percentage Change).

Psychological Factors and Birth Distribution

In the retained under 16-17s, both relatively older and younger players *Training Stress* increased over the season. Additionally, relatively older retained under 16-17s ability to *Identify* and *Describe Feelings* along with their *Emotional Stability* improved over the season. Furthermore, it was observed amongst the relatively younger retained under 16-17s players that *Extraversion* and *Openness to New Experiences* scores had increased from timepoint 1 to timepoint 2. At time point 1, relatively older players had more *difficulty identifying feelings* than relatively younger players. Additionally, by time point 2, relatively older players were more *optimistic* than relatively younger players (See Table 15).

In the retained under 17-18s, both relatively older and younger players *Emotional Stability* and *Openness to new Experiences* increased over the season. Additionally, relatively younger retained

under 17-18s had higher scores by the second timepoint in *Extraversion*, *Conscientiousness* and *Agreeableness* and relatively older retained under 17-18s. Furthermore, it was observed amongst the retained under 17-18s, that relatively older players *Exhaustion* and *Sport Devaluation* had increased between the two timepoints, and their ability to *Identify Feelings* had improved. Additionally, relatively younger retained under 17-18s players *Commitment to Training* had decreased over the season. At timepoint 1, relatively younger players were scoring higher in *Life Stress* than relatively older players, however by time point 2 there was no difference in *Life Stress* (See table 16; See Appendices for Percentage Change).

Table 13: Longitudinal results for anthropometric and physical performance measurements in retained Under 16-17s regional players over one season and the effects of birth distribution on development.

Retained U16s 2019-2020	Differences between Birth Distributions at each Timepoint						The Difference in Relative Age over a Season			
	Time Point 1			Time Point 2			Actual Difference			
	H1	H2	*P*	H1	H2	*P*	H1	*P*	H2	*P*
Height (cm)	180.3 ± 5.0	175.6 ± 5.0	**0.017****	181.7 ± 4.6	177.2 ± 5.2	**0.019****	1.4 ± 0.4	**0.001****	1.6 ± 0.6	**0.017****
Weight (kg)	80.5 ± 9.1	75.7 ± 18.4	0.372	86.1 ± 8.6	83.3 ± 19.1	0.608	5.6 ± 0.8	**0.000****	7.6 ± 0.9	**0.000****
Bronco (s)	313 ± 23.6	313 ± 36.6	0.988	329 ± 24.2	337 ± 50.7	0.575	16.1 ± 21.2	**0.011****	24.2 ± 6.9	**0.004****
CMJ (cm)	48.6 ± 6.2	46.4 ± 8.4	0.546	48.9 ± 5.5	45.4 ± 6.8	0.125	0.3 ± 2.4	0.890	-1.0 ± 2.4	0.694
DH Grip Strength (kg)	39.1 ± 4.7	40.8 ± 7.0	0.483	44.1 ± 4.3	45.9 ± 5.6	0.289	5.0 ± 1.0	**0.000****	5.1 ± 1.0	**0.000****
NDH Grip Strength(kg)	37.1 ± 5.5	37.8 ± 6.9	0.768	40.5 ± 5.3	42.4 ± 4.9	0.267	3.5 ± 1.5	**0.032****	4.6 ± 0.9	**0.000****
10m Sprint (s)	1.78 ± 0.06	1.82 ± 0.10	0.277	1.83 ± 0.09	1.85 ± 0.8	0.714	0.05 ± 0.1	**0.001****	0.03 ± 0.03	0.405
40m sprint (s)	5.62 ± 0.21	5.71 ± 0.43	0.628	5.62 ± 0.30	5.74 ± 0.31	0.338	-0.00 ± 0.6	0.972	0.03 ± 0.12	0.821
Momentum (kg/ms)	581 ± 60.2	546 ± 146.0	0.244	618 ± 58.8	591 ± 124.2	0.505	37.3 ± 8.7	**0.001****	45.0 ± 12.6	**0.006****
Power (w)	1474 ± 351.0	1373 ± 306.8	0.429	1557 ± 424.6	1509 ± 269.2	0.766	83.3 ± 87.5	0.357	135.7 ± 51.7	**0.022****
PAP (w)	4306 ± 1081	4283 ± 655.4	0.948	4616 ± 984.8	4518 ± 517.5	0.749	309.8 ± 305.1	0.326	234.6 ± 144.3	0.130

Key: *Sig.* = significance values p < 0.05; H*1 and H2* = Half year birth distributions, H1 = 1st September – 28th/29th February; and H2 = 1st March – 31st August

Table 14: Longitudinal results for anthropometric and physical performance measurements in retained Under 17-18s regional players over one season and the effects of birth distribution on development

Retained U17s 2019-2020	Differences between Birth Distributions at each Timepoint						The Difference in Relative Age over a Season			
	Time Point 1			Time Point 2			Actual Difference			
	H1	H2	*P*	H1	H2	*P*	H1	*P*	H2	*P*
Height (cm)	180.6 ± 3.9	181.0 ± 6.5	0.851	181.6 ± 3.9	181.6 ± 6.5	0.988	1.0 ± 0.2	**0.001****	0.6 ± 0.2	**0.010****
Weight (kg)	81.9 ± 11.9	80.1 ± 11.0	0.761	88.6 ± 11.0	85.9 ± 15.5	0.683	6.7 ± 0.9	**0.000****	5.8 ± 1.8	**0.018****
Bronco (s)	306 ± 19.8	299 ± 16.7	0.456	320 ± 33.4	334 ± 34.1	0.413	14.3 ± 23.9	0.092	35.3 ± 10.1	**0.013****
CMJ (cm)	54.8 ± 8.7	56.9 ± 7.5	0.441	53.4 ± 8.1	53.3 ± 5.7	0.975	-1.3 ± 1.9	0.504	-3.6 ± 1.6	0.070
DH Grip Strength (kg)	48.7 ± 5.4	46.8 ± 2.5	0.492	52.2 ± 6.3	49.9 ± 2.7	0.467	3.5 ± 0.9	**0.005****	3.1 ± 1.0	**0.025****
NDH Grip Strength(kg)	45.6 ± 4.6	42.8 ± 3.4	0.124	48.6 ± 5.6	47.0 ± 3.5	0.588	3.0 ± 2.7	**0.010****	4.2 ± 1.3	**0.031****
10m Sprint (s)	1.79 ± 0.08	1.71 ± 0.07	**0.040****	1.80 ± 0.09	1.72 ± 0.07	0.090	0.01 ± 0.01	0.480	0.01 ± 0.01	0.175
40m sprint (s)	5.47 ± 0.20	5.32 ± 0.18	0.104	5.52 ± 0.22	5.36 ± 0.24	0.227	0.04 ± 0.02	0.112	0.04 ± 0.02	0.149
Momentum (kg/ms)	581 ± 67.1	595 ± 74.4	0.823	630 ± 67.2	629 ± 99.9	0.994	48.4 ± 7.7	**0.000****	34.3 ± 11.2	**0.028****
Power (w)	1642 ± 198.0	1621 ± 99.2	0.806	1674.0 ± 370.9	1374 ± 446.3	0.152	32.3 ± 113.4	0.782	-247.1 ± 180.3	0.220
PAP (w)	4912 ± 343.0	4985 ± 274.5	0.645	4874 ± 966.8	4149 ± 1393.4	0.223	-38.3 ± 308.6	0.904	-836.7 ± 525.0	0.162

Key: *Sig.* = significance values p < 0.05; H1 and H2 = Half year birth distributions, H1 = 1st September – 28th/29th February; and H2 = 1st March – 31st August

Table 15: Longitudinal results for psychological assessments in retained Under 16-17s regional players over one season and the effects of birth distribution on development.

Retained U16s 2019-2020	Differences between Birth Distributions at each Timepoint						The Difference in Relative Age over a Season			
	Time-Point 1			Time-point 2			Actual Difference in H1 and H2			
	H1	H2	*P*	H1	H2	*P*	H1	P	H2	P
Outcome Focus	8.6 ± 1.6	8.2 ± 1.2	0.355	8.6 ± 1.4	8.1 ± 1.8	0.340	0.0 ± 0.3	1.000	-0.1 ± 0.4	0.905
Mastery Focus	9.3 ± 1.1	9.1 ± 0.8	0.369	8.9 ± 1.3	8.8 ± 1.5	0.827	-0.5 ± 0.5	0.384	-0.3 ± 0.3	0.284
Commitment	8.1 ± 1.4	8.3 ± 1.0	0.584	8.0 ± 1.1	7.9 ± 1.2	0.774	-0.1 ± 0.2	0.687	-0.4 ± 0.3	0.304
Athlete Burnout	31.9 ± 6.2	30.7 ± 5.4	0.469	31.6 ± 6.7	29.6 ± 7.7	0.309	-0.3 ± 1.0	0.784	-1.1 ± 2.7	0.552
Exhaustion	10.0 ± 3.3	9.9 ± 2.7	0.778	9.9 ± 2.7	9.2 ± 3.0	0.422	-0.1 ± 0.5	0.815	-0.5 ± 1.0	0.504
Reduce Sense of Accomplishment	13.4 ± 2.2	12.9 ± 2.2	0.469	13.0 ± 2.7	12.1 ± 3.2	0.303	-0.4 ± 0.6	0.534	-0.8 ± 0.9	0.348
Sport Devaluation	8.5 ± 2.8	8.0 ± 3.0	0.541	8.8 ± 3.0	8.7± 2.9	0.511	-0.2 ± 0.5	0.637	0.2 ± 1.9	0.825
Life Stress	5.9 ± 2.2	5.6 ± 3.6	0.467	8.1 ± 1.6	8.8 ± 1.9	0.319	2.1 ± 3.7	**0.010****	3.2 ± 5.7	**0.020****
Training stress	6.1 ± 2.5	5.8 ± 2.4	0.655	7.1 ± 2.0	6.8 ± 2.0	0.393	2.0 ± 2.8	0.256	1.1 ± 2.7	0.170
Athlete Identity	7.0 ± 1.9	6.5 ± 1.8	0.318	6.8 ± 2.1	6.6 ± 1.8	0.607	-0.2 ± 0.4	0.664	0.1 ± 1.2	0.862
Optimism	14.6 ± 2.6	14.0 ± 2.7	0.414	14.7 ± 2.1	13.1 ± 3.0	**0.022****	0.0 ± 2.4	0.943	-1.0 ± 0.2	0.108
Alexithymia	17.0 ± 2.2	16.2 ± 3.2	0.055	14.4 ± 1.9	13.8 ± 3.0	0.335	-2.6 ± 0.6	**0.001****	-2.3 ± 1.3	0.106
Difficulty Identifying Feelings	6.2 ± 1.3	5.2 ± 2.3	0.568	4.2 ± 1.3	4.5 ± 2.2	0.838	-2.0 ± 0.4	**0.000****	-0.8 ± 1.4	0.457
Difficulty Describing Feelings	5.3 ±1.8	4.8 ± 2.2	**0.034****	4.8 ± 1.8	4.0 ± 2.2	0.444	-0.5 ± 0.8	0.432	-0.8 ± 1.2	0.413
Externally Orientated Feelings	5.1 ± 1.4	6.2 ± 1.1	0.629	5.6 ± 1.7	5.8 ± 2.0	0.474	0.6 ± 1.9	0.383	-0.3 ± 1.2	0.660
Perfectionistic Concerns	14.5 ± 3.8	13.6 ± 2.5	0.350	14.5 ± 2.5	13.1 ± 2.6	0.055	-0.0 ± 0.6	0.961	-0.6 ± 0.8	0.396
Perfectionistic Striving	6.9 ± 1.6	6.4 ± 1.3	0.227	7.4 ± 3.7	6.1 ± 1.4	0.141	0.5 ± 0.6	0.473	-0.3 ± 0.5	0.444
Self-Esteem	13.8 ± 2.5	12.5 ± 3.3	0.089	14.4 ± 3.3	13.0 ± 3.0	0.129	0.6 ± 0.5	0.278	0.6 ± 2.2	0.457
Extraversion	8.5 ± 1.5	7.9 ± 1.4	0.182	8.8 ± 1.8	9.1 ± 1.4	0.557	0.3 ± 0.5	0.460	1.2 ± 2.2	**0.031****
Agreeableness	8.7 ± 1.5	8.2 ± 1.4	0.792	9.1 ± 1.4	9.3 ± 2.2	0.841	0.4 ± 0.2	0.152	0.7 ± 1.7	0.159
Conscientiousness	8.4 ± 1.7	9.1 ± 2.7	0.634	9.1 ± 2.7	9.4 ± 2.5	0.625	0.7 ± 0.6	0.269	1.2 ± 2.5	0.059
Emotional Stability	7.8 ± 1.3	8.0 ± 1.2	0.757	8.9 ± 2.6	9.1 ± 2.5	0.684	1.0 ± 0.4	**0.026****	1.2 ± 2.4	0.064
Openness to New Experiences	8.6 ± 1.7	8.5 ± 1.4	0.861	9.5 ± 2.1	9.7 ± 2.3	0.625	0.9 ± 0.5	0.068	1.2 ± 2.4	**0.042****

Key: *Sig.* = significance values $p < 0.05$; H*1 and H2* = Half year birth distributions, H1 = 1st September – 28th/29th February; and H2 = 1st March – 31st August

Table 16: Longitudinal results for psychological assessments in retained Under 17-18s regional players over one season and the effects of birth distribution on development.

Retained U17s 2019-2020	Players Development from First and Second Talent Camp						The Difference in Relative Age over a Season			
	Time-Point 1			Time-point 2			Actual Difference in H1 and H2			
	H1	H2	*P*	H1	H2	*P*	H1	P	H2	P
Outcome Focus	8.7 ± 1.4	8.3 ± 1.4	0.437	9.0 ± 1.1	8.6 ± 1.2	0.339	0.3 ± 1.0	0.302	0.3 ± 1.5	0.529
Mastery Focus	8.8 ± 1.2	9.0 ± 1.0	0.609	9.1± 1.1	9.3 ± 1.0	0.613	0.3 ± 0.8	0.263	0.3 ± 0.9	0.429
Commitment	7.4 ± 1.6	7.8 ± 1.1	0.508	7.3 ± 1.4	6.8 ± 0.9	0.292	-0.1 ± 0.9	0.901	-0.9± 0.3	**0.005****
Athlete Burnout	29.9 ± 5.1	31.8 ± 5.1	0.312	32.3 ± 7.5	32.2 ± 6.2	0.933	2.5 ± 5.6	0.108	0.3 ± 3.6	0.825
Exhaustion	9.4 ± 2.6	10.3 ± 2.9	0.402	11.2 ± 2.9	11.9 ± 3.6	0.534	1.8 ± 3.0	**0.008****	1.7 ± 2.5	0.072
Reduce Sense of Accomplishment	13.1 ± 2.6	14.0 ± 1.6	0.298	12.1 ± 3.0	12.3 ± 2.3	0.791	-1.1 ± 1.1	0.314	-1.7 ± 0.4	0.099
Sport Devaluation	7.4 ± 2.0	7.6 ± 2.0	0.799	9.2 ± 3.2	7.9 ± 2.1	0.247	1.8 ± 2.9	**0.003****	0.3 ± 1.5	0.529
Life Stress	6.8 ± 2.1	8.3 ± 1.9	**0.048****	6.3 ± 2.8	7.9 ± 1.7	0.212	-0.5 ± 2.0	0.657	-0.4 ± 0.3	0.200
Training stress	6.8 ± 2.7	9.3 ± 2.7	0.107	7.3 ± 2.3	8.1 ± 2.4	0.132	0.5 ± 2.8	0.634	-1.1 ± 0.4	0.121
Athlete Identity	5.8 ± 3.3	6.5 ± 2.8	0.570	6.4 ± 2.2	5.6 ± 1.1	0.246	0.6 ± 2.1	0.467	-0.9 ± 0.7	0.237
Optimism	12.3 ± 6.1	11.5 ± 4.6	0.690	14.3 ± 2.9	13.8 ± 1.9	0.606	2.0 ± 4.6	0.120	2.3 ± 5.8	0.163
Alexithymia	16.7 ± 3.2	15.6 ± 2.1	0.993	14.1 ± 2.9	15.9 ± 3.1	0.501	-2.6 ± 1.2	0.062	0.3 ± 3.7	0.846
Difficulty Identifying Feelings	4.9 ± 1.4	4.9 ± 1.2	0.389	3.1 ± 1.1	4.4 ± 1.4	0.690	-1.8 ± 0.4	**0.001****	-0.4 ± 1.8	0.658
Difficulty Describing Feelings	5.1 ± 1.9	5.0 ± 1.5	0.861	4.4 ± 1.4	4.6 ± 1.8	0.402	-0.7 ± 1.1	0.406	-0.4 ± 1.6	0.617
Externally Orientated Feelings	5.8 ± 1.5	6.3 ± 1.8	0.740	5.8 ± 2.3	6.1 ± 0.7	0.527	0.0 ± 1.8	1.000	-0.1 ± 1.4	0.829
Perfectionistic Concerns	11.4 ± 5.9	12.2 ± 4.3	0.597	13.2 ± 3.0	13.3 ± 2.6	0.917	1.8 ± 4.5	0.170	1.2 ± 4.6	0.465
Perfectionistic Striving	6.1 ± 3.0	5.8 ± 2.1	0.725	8.4 ± 6.5	7.5 ± 5.3	0.698	2.3 ± 5.7	0.184	1.8 ± 5.3	0.295
Self-Esteem	12.7 ± 5.1	11.5 ± 5.8	0.965	13.4 ± 2.8	13.9 ± 2.8	0.656	0.8 ± 3.1	0.485	2.4 ± 6.3	0.203
Extraversion	7.4 ± 3.2	6.8 ± 3.3	0.598	9.1± 2.3	9.3 ± 1.8	0.730	1.7 ± 3.4	0.059	2.6 ± 4.8	**0.029****
Agreeableness	8.3 ± 3.3	7.1 ± 3.6	0.335	8.2 ± 2.0	9.3 ± 1.7	0.125	-0.1 ± 1.8	0.903	2.3 ± 4.1	**0.020****
Conscientiousness	7.1 ± 2.9	6.2 ± 3.0	0.395	8.9 ± 2.5	8.5 ± 3.3	0.718	1.8 ± 3.5	0.076	2.3 ± 5.0	**0.041****
Emotional Stability	6.7 ± 2.9	6.1 ± 3.0	0.560	9.7 ± 2.9	9.1 ± 3.1	0.568	3.0 ± 4.8	**0.003****	3.0 ± 5.4	**0.019****
Openness to New Experiences	7.5 ± 3.0	6.9 ± 3.5	0.592	9.4 ± 2.0	10.6 ± 1.7	0.116	1.9 ± 3.5	**0.026****	3.7 ± 5.9	**0.004****

Discussion

The aim of this longitudinal study was to track the annual development of anthropometric, physical performance and psychological characteristics whilst considering the impact relative age has on the development of retained regional age grade rugby union players aged between 16 and 18 years over one season. The main findings revealed anthropometric and physical performance development over the longitudinal period for both birth distributions in each retained age category. Interestingly, personality traits increased between the two timepoints for both older and younger retained under 17-18s, however, there was also anincrease in older retained players exhaustion and sport devaluation scores.

The findings of this study observed height and weight increments in retained under 16-17s and retained under 17-18s between the first and second talent camp. Early maturation is associated with accelerated development in anthropometric parameters, and late developers slowly catch-up with older counterparts in late adolescence (Brown, Patel, & Darmawan, 2017; Towlson et al., 2018). Therefore, it was interesting to observe amongst the retained under 16-17s the difference between weight measurements between older and younger players. In the first timepoint there was an average 7.9kg body-mass difference between relatively older and younger players and by the second timepoint the difference was much less (i.e., 2.8kg), suggesting younger players had a greater development phase anthropometrically over the season closing the weight gap between older and younger players. Previous research has shown relatively younger players to physically progress more and potentially outperform relatively older players between adolescence and early adulthood (Till et al, 2013), however, in the retained under 16-17s, older players were still taller than younger players at both timepoints.

The consensus across youth team sports asserts physiological characteristics having impact on physical performance development, particularly in speed, strength, and power (Baxter-Jones et al., 2020; Meylan et al., 2010). Accelerated development amongst male adolescent has previously observed static strength, explosive strength and muscular endurance increments occurring around 6 months to a year after reaching peak height velocity, whereas speed tests and flexibility occur prior to

reaching peak height velocity (Beunen & Malina, 2008; Towlson et al., 2018). The findings of this study observed strength and momentum increments across both birth distributions and each age category. Additionally, bronco times were slower by the second timepoint in particularly amongst younger players and in the retained under 16-17s older players sprint time over 10m had increased, however, there were no progression in sprint ability observed in this study. Similarly, Kobal et al (2016) and Owen et al (2020) documented no difference in muscular power, linear speed progression, and endurance capacities between under 17s and under 19s rugby players. Furthermore, Casserley et al (2019) longitudinal findings, tracked 15 adolescent rugby union players from under 18s into under 20s and their body mass was found to be a conceivable mediator for speed performance and aerobic capacity. Because acquiring greater body mass has previously been negatively associated with speed and aerobic capacity amongst rugby union players (Barr et al., 2014; Darrall-Jones et al., 2016; Wood, Coughlan, & Delahunt, 2018). The fluctuations in running performance due to increased body mass may impact sprint velocity negatively (Darral-Jones, Roe, et al., 2015) but can positively generate more momentum (Darrall-Jones, Jones, & Till, 2016). Furthermore, in pre-adolescent male basketball, anthropometric growth has been documented to influence motor skills ability, speed, agility, and upper limb explosive strength during their growth period (Beunen & Malina, 2008; Rinaldo, et al, 2020) which potentially supports the notion that physical capacities are substantially confounded by maturation (Pearson, Naughton & Torode, 2006). It was observed in this study that groups who gained more body mass (i.e., younger under 16-17s and older under 17-18s) had a greater increase in their momentum and power than their corresponding counterparts. In rugby union, it is important to maintain players running ability, whilst increasing strength, power, and mass to remain on the player performance pathway (Jones et al., 2018).

The psychological results presented personality traits changed over the longitudinal period. It was observed across both retained age groups that personality traits increased over the season, but results were most predominant in the younger retained under 17-18s, as all the big-five personality traits (i.e., Extraversion, Agreeableness, Conscientiousness, Emotional Stability and Openness) had developed. However, the greater development in personality traits did not differentiate younger and older players. Interestingly, Lenz, Schmidt & Schreyer (2020) paper goes into detail regarding the

738 impact of personality traits on talented players throughout the development process in soccer. The
739 increase in emotional stability within talent development is associated with individuals striving to
740 meet expectations, to withstand intense competitions, and to cope with the pressures of selection
741 (Gosh & Waldman, 2010) along with possessing a greater self-confidence. During adolescence and
742 early adulthood, individuals develop a more mature and stable personality profile (Van Dijk, et al.,
743 2020). Identifying personality traits in players is gaining more attention in research (Jooste et al.,
744 2019; Weakley, Willson & Till et al., 2020), for example it has been speculated that knowing an
745 individual's conscientiousness levels can help coaches tailor feedback methods (Cianci, Klein &
746 Seijts, 2010). Rugby union players with lower conscientiousness levels will perform more optimally
747 in maximal voluntary contractions when verbally encouraged in comparison to players with greater
748 conscientiousness levels who self-motivate themselves (Binboğa et al., 2013; Weakley, Wilson & Till
749 et al., 2020). It has been argued that conscientiousness is generally considered the most important
750 personality trait for success in sport (Allen et al., 2013; Wilmot & Ones, 2019) as it possesses the
751 elements of optimal performance (e.g., self-motivation, organisation and goal directed behaviour;
752 Costa & McCrae, 1992). Additionally, agreeableness, has previously been identified as a significant
753 predictor and positively correlated with of sport performance, team-playerness and work ethic (Habib,
754 Waris, & Afzal., 2020). Furthermore, emotional stability allows individuals to be more adept to deal
755 with success and failures of sport demands (Patel, Pratt, & Greydanus, 1998). Athletes, especially in
756 team sports (Gee et al., 2007) generally express higher levels of emotional stability (Kajtna el al.,
757 2004; Steca et al., 2018). The results of this study along with findings of previous research is
758 supporting the narrative that younger players develop a psychological advantage over older players
759 (Jones, Lawrence, & Hardy, 2018). The reversal effect considers relatively younger players being
760 more likely to transition into senior professional squads after an exposure to adverse development
761 environment as an element of triumph in talent developments programmes (Hill, MacNamara, &
762 Collins, 2015; McCarthy, Collins, & Court, 2016; Till, Weakley, Read, 2020). The findings of this
763 study further support this notion, as during the longitudinal period, relatively older players in the
764 retained under 17-18s burnout symptoms had increased substantially more over the season than
765 relatively younger players (e.g., Athlete Burnout: H1= 10%, H2 = 1.7% Increase; Emotional and

Physical Exhaustion increased by: H1 22.1%, H2 = 10.2% and Sport Devaluation increased by: H1 = 23.8% and H2 = 6.8%). The findings potentially elicit relatively older players struggling with relatively younger players physical and performance improvements (i.e., catching up with older players performance standards) therefore placing additional pressures on themselves to remain superior (Fraser-Thomas & Cote, 2009). Encouraging a coaches understanding of psychological factors can enhance how players are assessed during selection programmes, due to the association psychological factors have with facilitating and derailing progression (Nicholls & Polma, 2007; Till, Weakley, Read et al, 2020). Psychological development has been acknowledged as a key factor in identifying long-term potential and success in sport (Till, Weakley, Read et al, 2020). Therefore, the advancements in psychological behaviours and traits highlight the importance of tracking players from youth to senior level to avoid the wrongful inclusion or exclusion because our current understanding of how talent develops and evolves is limited (Johnston & Baker, 2019; Schorer, Roden Büsch, and Faber, 2020).

The strengths of the study were the broad range of variables used to track the anthropometric, physical performance and psychological developmental differences between birth distributions longitudinally. This approach is amongst the first to track the psychological differences in rugby union in regards to relative age to support the theory that psychological factors are the explanation towards why younger players are typically more represented in professional sport (Jones et al., 2018). Nonetheless, the study had its limitations. Whilst we had 84 participants for the study, which is a considerable amount for a longitudinal study design, nearly half were lost during anthropometric and physical performance assessments, which may have impacted the findings to why no change was recorded over the season. This was due to players not following correct performance execution instructions, or injury during one of the talent camps (For Example: missing the timing gate during 40m sprint). This led to participants being removed from the physical side of the study but not the psychological. Also, one season, which was two time points was not a long enough period of time to measure change in development in particularly amongst the late stage of adolescent development where performance and growth increments occur at a slower rate. The reason for only collecting data on two consecutive occasions was the duration of the Masters by Research degree course. Future

research should consider tracking players from when players enter the pathway through to early adulthood (i.e., under 23s).

Conclusion

In conclusion, this study achieved to identify the psychological characteristics which develop predominantly in each birth distribution over a longitudinal period in a age grade regional rugby union setting. Our study provides a start towards presenting psychological evidence for the reversal effect theory proposed by Jones, Lawrence, and Hardy (2018). It is important to continue to monitor the psychological development of player to be able to pinpoint when relatively younger players begin to develop superior characteristics and to record which traits and states are stable and remain the same throughout the pathway. Longitudinal studies are necessary when considering long-term development outcomes amongst youth players as they continue to develop and progress into their early twenties which offers a considerable amount of time for relatively younger players to catch up anthropometrically, physically, and psychologically with their older counterparts. Future research on psychological determinants of selection can help formulate a psychological player profile, which will aid coaches during the selection process and help monitor the health and well-being of players.

GENERAL DISCUSSION

Summary of Research Findings

The purpose of this thesis was to examine the physiological and psychological differences between regional and club and the pervasiveness of relative age in age grade rugby union whilst examining the psychological factors that may differentiate birth distribution. Overall, the study achieved to differentiate the physiological and psychological differences between age grade playing standards in study 1, observed biases towards selecting players for regional representation when they have a more advanced physical abilities in study 2, and identified psychological factors which may potentially support the reversal effect theory in study 3. The results detailed in this thesis set groundwork for future research to identify in further detail the psychological factors that differentiate older and younger players to then work towards establishing a psych curriculum in talent development programmes to support the progression of talented players.

The purpose of the first experimental chapter was to identify the anthropometric and physical performance differences to add to the current understanding of talent identification literature in rugby union and to identify the psychological differences of regional and club age grade players, across the annual age categories. We found that regional players were greater anthropometrically and were more robust in their physical abilities to perform better than club players. It was predominant that weight, power, and momentum differentiated regional and club players across all age categories in this study. These findings were consistent with previous studies (Barker et al., 1993; Williams & Reilly, 2000; Vaeyens et al., 2006, Gabbett et al., 2011; Gabbett, Comerford, & Stanton, 2014; Baker, 2017; Chiwaridzo et al, 2019) and are considered desirable qualities of the sport (Brazier et al, 2020). Additionally, unexpected psychological differences were found between regional and club players. Club backs presented superior coping skills (i.e., concentration skills and coachability) than regional backs in the under 18s and elite under 18s. The reasoning for suggesting the results is unexpected is previous research associates psychological skills such as coping strategies with success in elite rugby (Kruger 2003; Kruger 2005; Andrew, Potgieter, & Grobbelaar, 2007).

The second experimental chapter aimed to identify the effect relative age might have on the physiological and psychological differences between regional and club players. The physical

attributes of relatively older and more physically matured players may have provided a selection advantage in the younger age-categories (i.e., under 16s) as regional players (i.e., older, and younger) were greater anthropometrically and more robust in their physical abilities than club players. The psychological characteristic of this study supports the notion of the reversal effect theory (Jones et al., 2018). Not only were the younger elite players less burnout than older players but they were also scoring higher in extraversion, emotional stability, openness. These personality characteristics have previously been associated with optimal performance and traits of professional successful athletes (Morgan, 1985; Costa & McCrae, 1992; Connor-Smith & Flachsbart, 2007; Allen et al., 2013; Wilmot & Ones, 2019; Allen, Mison, Robson, & Laborde, 2020).

Experimental chapter three was a longitudinal approach examining the physiological and psychological development and progression between birth distributions in the player pathway to support the reversal effect theory. The findings revealed anthropometric and physical performance development over the longitudinal period for both birth distributions in each retained age category. Anthropometric increments effects physical performance: height and weight negatively impact speed and aerobic capacity amongst rugby union players (Barr et al., 2014; Darral-Jones et al., 2016; Wood, Coughlan, & Delahunt, 2018) and positively impact momentum and power (Darrall-Jones, Jones, & Till, 2016). Personality traits increased between the two timepoints for younger retained under 17-18s, and there was an increase in older retained players exhaustion and sport devaluation scores. However, the development in psychological characteristics did not differentiate between older and younger players.

Theoretical Implication

Research has recognised that selecting older players often leads to significant cognitive, physical, and emotional differences between players of the same annual age category (Andronikos et al., 2016) thus excluding equally skilled late developers from the same opportunities (Rothwell, Rumbold, & Stone, 2020). The athletic advantages associated with relatively older players can often lead to selection bias were relatively older players are overrepresented in sport (Kelly et al., 2021). However, the underdog hypothesis suggests the greatest potential for adulthood success is with younger players (Gibbs et al., 2012) as relative age effect may turn out to be beneficial for relatively

younger players (Schorer, et al, 2009). Although an apparent selection bias towards relatively older players was found in chapter 2, with older players possessing superior physiological attributes and abilities particularly in the under 16s, the underdog hypothesis was not confirmed by elite under 18s as younger elite players had not developed superior physiological attributes and abilities to older elite players. However, the differentiating performance gap had reduced, suggesting though there were no differences in performance standards observed between older and younger regional players, which leads to the assumption that younger and older players are performing at the same standard.

A theoretical rational for the underdog hypothesis can be found in recent research: several researchers (McCarthy & Collins, 2014; Hardy et al., 2016; McCarthy et al., 2016; Rees et al., 2016; Jones et al., 2018) propose younger players to have a stronger psychological profile (i.e., mental toughness, resilience, competitive drive) than relatively older players, which may have been developed from adverse and challenging experiences early in the development stages of the player pathway (e.g., training and competing against larger statures, the selection process and reselection). Results from study 2 and 3 offer support towards this rationale, that a reversal effect occurs due to younger players acquiring a superior psychological set of skills and traits from their challenging developmental experience. Younger players personality traits (i.e., Extraversion, Agreeableness, Conscientiousness, Emotional Stability, ad Openness) in chapter 3 developed over the season, whereas older players had greater increments in burnout subcomponents (i.e., exhaustion, sport devaluation). In the past decade, the stability of personality traits has been scrutinised (Elkins et al, 2017) it was once assumed a child's temperament was endowed at birth, yet this study and others have shown increase in an individuals' levels of conscientiousness, agreeableness and emotional stability between adolescence and early adulthood (Bledidorn et al, 2013; Elkins et al, 2017). The impact of developmental tasks and challenges are said to drive personality development (Lenz, Schmidt & Schreyer, 2020), which support the reversal effect theory, that younger players overcoming adversity are developing more positive personality traits required for successful career attainment when compared with older players.

Applied Implications

The findings from this study provides two applied implications which are discussed below:

Psychological Curriculum. Implementing personal health and well-being sessions into training should become a priority for developing the athlete as a 'whole'. A holistic developmental process encompasses technical, physical, tactical, social, and personal development (Till et al., 2020) and supports the health and well-being of athletes in the system, leading to fewer adverse physiological and psychological symptoms of derailment ad withdrawal (Stambulova et al., 2020). This study pinpointed that elite under 18s are scoring higher in athlete burnout (i.e., emotional exhaustion) and lower in coping strategies. The data suggests that elite under 18s may require additional support to manage academy training load, college training, education, social life, and part-time workload. Inquiries have been done in recognizing health and well-being issues with talent development programmes as athletes are no less at risk to the general population to be able to develop mental illness, (Hill, MacNamara, & Collins, 2015; Rothwell, Rumbold, & Stone, 2020). Talent identification and development models ignore the coping strategies that enable young players to successfully develop within the pathway (MacNamara, Button, & Collins, 2010). Coping skills is associated with managing performance related stress (Nichollos, Holt, & Bloomfield, 2006) and talent identification and development programmes have been challenged in relation to the developmental stress effects on youths; the negative impact they have on the physical health, educational and social life, identity, and psychological development (Rongen et al., 2018). For example, recent research in rugby union academies have identified a range of pressures that academy players can encounter (e.g., conflicting coaching styles, lack of individualised development sessions, a negative motivational climate) whilst operating in an intensive training and competitive environment, which can elevate a series of predominantly negative emotional, intrapersonal and performance development outcomes such as elevated burnout levels and stress symptoms (Rumbold et al., 2018; Daumiller, Rinas, & Breithecker, 2021). In a cross-sectional study, Harris and Watson (2014) considered three developmental age groups of athletes (i.e., 7-10 years, 11-14 years and 15-17 years) and their susceptibility to burnout. Controlling for potential confounds (i.e., motivation, athletic identity, enjoyment, and social constraints) it was reported athletes in the late adolescent stage (i.e., 15–17-year-olds) were significantly more exhausted, had greater cognitive weariness, and a greater sense of reduce accomplishment (Ingrell, Johnson, & Ivarsson, 2019). Talent development demands amongst late

adolescent teens increases their susceptibility to feel exhausted and disinterested in their participation, due to ongoing prolong stress which gradually results in a depletion of intrinsic motivation, often leading to premature dropout and a loss of a potential successful athletes (Simmons et al., 2009). Therefore, the player performance pathway should aim to support a holistic developmental approach for prospering a well-rounded player (Rongen, McKenna, Cobley, & Till., 2018) and help athletes develop a social support network to facilitate balancing and managing stress (e.g., constructive coping mechanisms) thus increasing their ability to tolerate and acknowledge negative emotions without being overwhelmed (Simmons et al., 2009).

Psychological Profiling. Underpinning an athletes psychological characteristics to develop a psychological profile can help with monitoring a players psychological development and assist coaches in identifying red flags of when athletes are not coping within training (Berki, Piko, & Page, 2020). Knowing which players can cope with the pressures of the development process and which players might need extra help to successfully cope may help with the mechanisms of achieving professional attainment (Abbott & Collins, 2002) and circumvent premature withdrawal and athlete burnout. Numerous researchers support the notion that longitudinal analysis on psychological characteristics should be considered during the development of potential future sporting stars (Forsman et al., 2016; McCarthy, Collins & Court, 2016; Murr et al., 2018; Schmid, Conzelmann, & Zuber, 2020; Till et al., 2020) as it can assist coaches in the selection and development process (Kruger, Plooy, & Kruger, 2019). Yet it can be argued that this holistic approach is complex and sets an unrealistic timeframe for decisions making (Baker et al., 2018; i.e., making a player's future development decisions for next season). From as early as 1971, researchers have emphasised the crucial role of the inclusion of psychological factors in the selection and development stages (Kunst & Florescu, 1971). Thus, placing emphasis on the recognition and utilisation of psychological characteristics and behaviours during the selection and development process and how they should be applied to optimise athletes performance (MacNamara, Button & Collins, 2010a; Andronikos et al., 2016).

Strengths and Limitations of the Research

There are some significant strengths to this thesis. Firstly, the study had successful participation

numbers for a small region. With a total of 259 players there was a high proportion from both regional and club players. The distribution of players allowed the study to provide an in-depth view on the talent identification programme and differentiate the psychological and physiological differences between playing standards over two-time points, therefore adding valuable information to the talent identification literature. Additionally, the inclusion of a longitudinal chapter is a positive action in consideration to the time constrains of a masters by research thesis. Having included multiple timepoints it allowed us to examine the physiological and psychological development of retained regional players in regards to the impact relative age might have on the variables. Thus, leading this study to be the first to our knowledge to provide initial evidence towards supporting the notion that younger players develop a superior set of psychological skills than older players to cause the reversal advantage where younger players are likelier to be overrepresented at adult professional level (Gibbs et al., 2012; Jones et al., 2018; Kelly et al., 2021). The psychological findings in chapter three potentially provide evidence of younger players in the retained under 18s (Mean age in 2019: 16.3 ± 0.3 years; Mean age in 2020: 17.1 ± 0.4 years) developing a superior psychological advantage over older players as the results presented younger players personality traits (i.e., extraversion, agreeableness, conscientiousness, emotional stability, openness to new experiences) becoming more stable over time whereas during the same time-period older players displayed burnout symptoms (i.e., exhaustion and sport devaluation. These personality traits have previously been linked with higher levels of coachability, optimal performance and success in sport (Costa & McCrae 1992; Connor-Smith & Flachsbart, 2007; Allen et al., 2013; Weinberg & Gould, 2015; Woodman & Roberts, 2015; Rees et al., 2016; Steca, et al., 2018; Kruger, Plooy, & Kruger, 2019; Steinbrink, Berger, & Kuckertz, 2020). However, this study has also considered that the burnout and stress results of this study could have been influenced by the external effects of competition and education because data was collected between late winter and early spring (i.e., February to April), this time-point is considered stressful for young adolescents (i.e., GCSEs and A-Level examinations, university applications and end of rugby season) which can lead to mood disturbances, decreased recovery and feeling unprepared to perform (Hartwig, Naughton, & Searl, 2009; Oliver, Lloyd, & Whitney, 2015; Quarrie et al., 2017). The intensive phases of competition, and life stress (i.e., school and club commitments) can lead to

burnout (Grobelaar et al., 2010) and it has been recorded by Phibbs et al., (2018) that training volumes are higher in regional academy players (190 hours per season) than club players (i.e., schoolboy; 72 hours per season). Future studies should consider the timepoints that data is collected to avoid external environments influencing results.

This study appreciates and recognises that chapter three may not be a true longitudinal design as data was only collected over two timepoints (i.e., April 2019 to February/March 2020) and did not track players into adulthood, senior level. The time constraint is a disadvantage towards the study (i.e., 1-year) and that the covid-19 pandemic eliminated a third timepoint (i.e., 2021 Talent Camp) being collected. Thus, has led to chapter three data not providing sufficient psychological evidence to support Jones and colleagues (2018) notion that a reversal advantage is due to younger players acquiring a superior set of psychological skills. Additionally, result in experimental chapter two could not confirm if a reversal advantage occurred as the chi-squared analysis was violated (i.e., expected count was lower than 5) when the age grade players were divided into playing standards (i.e., regional and club), therefore confirmation towards psychological factors developing over the season due to a reversal advantage could not be justified. However, previous research state a reversal advantage is not recognised until adulthood (Gibbs et al., 2012; Jones et al., 2018; Kelly et al., 2021). Therefore, the findings in experimental chapter 3 may have pinpointed the turning point where relatively younger A limitation that future research could resolve is the inclusion of females in talent identification literature. This study did not include the female rugby union age grade population for the differentiation between regional and club players because regional age grade female rugby population is not very established in North Wales. However, there is gender data gap in the talent identification and development research as a whole; between 1999 and 2019 only 9% of talent identification research (e.g., relative age effect and maturation of youths; sport specialisation) included female only participants in comparison to the 91% of male population (Curran, MacNamara, & Passmore, 2019; Kelly, Côté,, Jeffreys, & Turnnidge, 2021). Male talent identification findings cannot be related to females as it is well documented in the literature that there are physical and cognitive differences between males and females (Murica, Gimeno, & Coll, 2008; Clarke, Anson, & Pyne, 2017; Ball, Halaki, & Orr, 2019). The difference between genders can become problematic when applying male

findings to female development pathways. Therefore, future research should examine the physiological and psychological differences in female age grade regional and club players to identify if the findings counteract male players.

The holistic approach has been able to add to the current talent identification literature and set groundwork towards further research in differentiating regional and club age grade players psychological factors in regards to the impact of relative age. However, the integration of multiple psychological variables into two questionnaire needs some amending and reviewing, because individual questionnaires were shorted to be more player friendly' and suitable for the time constrained talent camps. This approach is regularly used in applied research (Dunn et al., 2019) to examine several variables, however by doing this the power and validity of the original questionnaire can be lost leading to under-representation of constructs. An example of shortening questionnaires is seen in the 'Athlete Coping Skills Inventory-28 (Smith, et al., 1995) and Toronto Alexithymia Scale – 20 (Bagby, Parker, & Taylor, 1994) were only the two highest factor loading items were taken from each subscale (e.g., 14 items used instead of 28 in the ACSI-28 and 6 items used instead of 20 items in the TAS-20). A possible solution is to provide more time to complete the questionnaire packs allowing researchers to include the original questionnaires in full but to also consider developing questionnaires similar to the 'Athlete Development Formulation Survey' by Dunn et samples. al., 2019, which include numerous variables which are fully validated and tested with several. Furthermore, more attention should be given to the inclusion of psychological characteristic questionnaires to meet the demand for a more holistic talent identification and development process. Such as, additional psychological variables (i.e., anxiety, depression, obsession, the 'dark side' characteristics; Hill et al., 2015 & 2016) should have been considered to monitor the mental health and well-being of players to examine whether players are at risk of derailment (Grant et al., 2013; Hill et al., 2015). Almost 50% of mental health illness cases are recognised by 14-years of age and 33.3% by the age of 24 which coincides with the age range of talent development programmes (Kessler et al., 2005; Hill et al., 2015). We had started monitoring academy players mood and well-being energy index of players (i.e., angry, vigour, fatigued, depressed, confused and tense) and recovery (i.e., sleep quality, perceived exertion, recovery) similar to the study by Shearer et al., 2015 on a daily

occurrence using the brief assessment of mood (BAM; Dean et al., 1990; McNair et al., 1971). It was noticeable early on during data collection fluctuations in the BAM in different players. Some individuals were consistently reporting high fatigue, bad sleep quality, low recovery and depression scores which are warning signs for coaches to step in and have a private conversations to check in on the players well-being. Coaches should be aware of the susceptibility of injury and illness in player reporting fatigue, low recovery, and depression (Shearer et al., 2015). However, BAM data collection was disrupted during the pandemic, therefore could not be included in the study.

Suggestions for Future Research Directions

The findings in this thesis provide preliminaries for further research regarding the reversal advantage (Collins & MacNamara, 2012; McCarthy, Collins, & Court, 2016; Jones et al., 2018) in relative age rugby union, little to no research has been successful in presenting when the reversal advantage may begin to emerge. Drawing from the strength and limitations of this thesis, future research should consider tracking players from the point of entry into the development programme through to senior level. The longitudinal period will provide stronger evidence to support the notion that younger players develop superior psychological factors. Having coaches become aware of psychological transitions can help during the selection process to not exclude promising future talent due to late development. Additionally, future research should utilise questionnaires which cover both the positive characteristics associated with successful career attainment and 'dark side' characteristics associated with derailment is important to acquire a picture of the athlete as a whole and to further identify individuals who are at risk of mental health issues. Furthermore, future studies should also consider running the study with female only participants to acknowledge not only the differences in male and female psychological development in the player pathway but to identify whether there is a reversal advantage in female cohorts and if it is associated with psychological development. The findings from a female only study would be beneficial for female rugby players and coaches in the talent identification and development programmes. As data would be applied towards tailoring training programmes suited for successful female progression and the necessary psychological support needed for player retention and well-being.

Conclusions

This current thesis provided an insight on the relevance of utilising psychological questionnaires to differentiate playing standards and pinpointing key discriminating factors of identifying psychological developmental differences between birth distributions. In conclusion, there is a growing acceptance of using psychological characteristics as a talent predictor and the need for more research to address the longitudinal changes and differences that occur psychologically between relatively older and younger players. Employing a multivariate and dynamic testing protocols to measure talented young players at different age groups annually is required to improve the accuracy of player profiles. Multidimensional talent models and holistic development pathways may represent a way of finding patterns in recognising psychological and physical performance variables that connect to create future success in rugby as it currently remains unclear. These large-scale studies can provide talent development academies with valuable information that may support important selection decisions and ensuring a more optimal and holistic talent development systems.

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APPENDICES

Table 1: The physiological results (Mean ± Standard Deviation) of Regional and Club Age Grade Players in each age-category and positions

The Team	**UNDER 16s**			**UNDER 18s**			**Elite Under 18s**		
	REGIONAL (*n* = 80)	**CLUB (*n* = 66)**	***P***	**REGIONAL (n =49)**	**CLUB (*n* = 33)**	***P***	**Elite (*n* =31)**	**Under 18s (*n* = 82)**	***P***
Height (cm)	176.8 ± 6.5	173.8 ± 7.0	**0.008****	179.9 ± 5.6	177.8 ± 7.1	0.145	181.0 ± 6.1	179.0 ± 6.3	0.134
Weight (kg)	76.0 14.6	70.3 ± 13.5	**0.017****	84.6 ± 13.7	76.4 ± 11.0	**0.005****	87.2 ± 11.2	81.3 ± 13.2	**0.029****
Countermovement Jump (cm)	47.6 ± 6.9	46.2 ± 6.4	0.202	51.7 ± 7.9	52.9 ± 7.5	0.509	53.0 ± 7.8	52.2 ± 7.7	0.639
DH Grip Strength (kg)	40.9 ± 6.1	38.6 ± 6.7	**0.033****	47.1 ± 6.5	45.7 ± 5.6	0.345	49.8 ± 8.2	46.5 ± 6.2	**0.026 ****
NDH Grip Strength (kg)	37.7 ± 6.5	35.9 ± 7.0	0.114	44.0 ± 6.5	41.8 ± 5.1	0.109	47.4 ± 7.1	43.1 ± 6.0	**0.002****
10m Sprint (s)	1.81 ± 0.12	1.84 ± .10	0.072	1.78 ± 0.09	1.78 ± 0.10	0.918	1.78 ± 0.09	1.78 ± 0.09	0.788
40m sprint (s)	5.63 ± 0.34	5.83 ± .39	**0.002****	5.52 ± 0.27	5.51 ± 0.42	0.856	5.50 ± 0.30	5.51 ± 0.33	0.835
DL Agility (s)	8.75 ± 0.43	8.44 ± .30	**0.002****	8.49 ± 0.47	8.30 ± 0.27	0.116	8.29 ± 0.47	8.40 ± 0.40	0.426
NDL Agility (s)	8.92 ± 0.43	8.59 ± .36	**0.001****	8.63 ± 0.47	8.49 ± 0.26	0.221	8.43 ± 0.43	8.57 ± 0.39	0.290
Momentum (kg/ms)	540 ± .94.2	483 ± 83.5	**0.000****	611 ± 82.8	551 ± 68.3	**0.002****	632 ± 58.3	588 ± 82.3	**0.008****
Power (w)	5293 ± 923.0	4634 ± 819.0	**0.000****	5988 ± 811.6	5402 ± 668.4	**0.002****	6196 ± 571.5	5761 ± 807.2	**0.009****
PAP (w)	4247 ± 766.1	3925 ± 630.8	**0.008****	4902 ± 565.0	4594 ± 465.0	**0.014****	7162 ± 420.6	4776 ± 544.9	**0.000****
Age Grade Forwards	**UNDER 16s**			**UNDER 18s**			**Elite Under 18s**		
	REGIONAL (*n* = 44)	**CLUB (*n* = 35)**	***P***	**REGIONAL (n =26)**	**CLUB (*n* = 12)**	***P***	**ELITE (*n* =19)**	**Under 18s (*n = 38)***	***P***
Height (cm)	179.2 ± 5.9	175.5 ± 5.5	**0.004****	181.7 ± 5.9	1817 ± 6.6	0.995	182.0 ± 7.1	180.5 ± 6.0	0.406
Weight (kg)	82.9 ± 14.8	74.5 ± 15.1	**0.019****	91.5 ± 14.9	84.9 ± 11.3	0.184	94.1 ± 13.8	84.9 ± 12.9	**0.017****
Countermovement Jump (cm)	45.7 ± 6.4	44.9 ± 6.6	0.602	49.3 ± 7.1	47.6 ± 8.7	0.542	51.4 ± 8.3	48.8 ± 7.5	0.238
DH Grip Strength (kg)	41.2 ± 5.2	40.3 ± 6.5	0.482	52.8 ± 5.7	44.7 ± 5.5	**0.012****	51.3 ± 8.6	46.8 ± 7.0	**0.043****
NDH Grip Strength (kg)	37.4 ± 5.4	37.6 ± 7.2	0.898	50.4 ± 7.4	40.2 ± 2.9	**0.006****	47.6 ± 7.5	43.3 ± 7.0	**0.039****
10m Sprint (s)	1.85 ± 0.13	1.86 ± 0.11	0.619	1.81 ± 0.08	1.85 ± 0.12	0.276	1.82 ± 0.09	1.82 ± 0.09	0.935
40m sprint (s)	5.77 ± 0.32	5.91 ± 0.41	0.097	5.63 ± 0.26	5.83 ± 0.47	0.136	5.65 ± 0.27	5.69 ± 0.34	0.639
DL Agility (s)	8.65 ± 0.33	8.90 ± 0.53	0.093	8.46 ± 0.37	8.77 ± 0.60	0.219	8.46 ± 0.37	8.40 ± 0.32	0.409
NDL Agility (s)	8.82 ± 0.38	9.09 ± 0.48	0.069	8.63 ± 0.36	8.88 ± 0.61	0.338	8.63 ± 0.37	8.55 ± 0.32	0.583
Momentum (kg/ms)	577 ± 90.2	505 ± 83.3	**0.001****	645 ± 89.2	592 ± 66.5	0.104	661 ± 72.1	617 ± 78.5	0.057
Power (w)	5658 ± 883.3	4946 ± 816.3	**0.001****	6317 ± 873.8	5801 ± 650.4	0.103	6382 ± 545.2	6165 ± 839.3	0.317
PAP (w)	4488 ± 604.6	4020 ± 644.1	**0.002****	5062 ± 573.3	4709 ± 481.4	0.086	7293 ± 455.5	4951 ± 564.1	**0.000****
Age Grade Backs	**UNDER 16s**			**UNDER 18s**			**Elite Under 18s**		
	REGIONAL (*n* = 36)	**CLUB (*n* = 31)**	***P***	**REGIONAL (*n* = 36)**	**CLUB (*n* = 31)**	***P***	**Elite (*n* =11)**	**Under 18s (*n = 44)***	***P***
Height (cm)	173.9 ± 6.2	171.8 ± 8.0	0.233	177.8 ± 4.7	175.6 ± 6.5	0.183	180.5 ± 4.1	176.8 ± 5.7	**0.045****
Weight (kg)	67.5 ± 8.8	65.6 ± 9.6	0.389	76.8 ± 6.1	71.5 ± 7.2	**0.011****	79.7 ± 7.2	74.2 ± 7.1	**0.028****
Countermovement Jump (cm)	50.0 ± 6.8	47.6 ± 5.9	0.134	54.4 ± 8.0	55.8 ± 5.0	0.515	55.3 ± 6.4	55.2 ± 6.7	0.952
DH Grip Strength (kg)	40.5 ± 7.1	36.6 ± 6.6	**0.026****	45.9 ± 5.0	46.6 ± 6.0	0.685	47.1 ± 6.8	46.2 ± 5.4	0.786
NDH Grip Strength (kg)	38.0 ± 7.8	33.7 ± 6.3	**0.021****	43.3 ± 4.6	42.7 ± 5.7	0.712	46.8 ± 7.3	43.0 ± 5.1	**0.044****
10m Sprint (s)	1.76 ± 0.09	1.82 ± 0.09	**0.010****	1.74 ± 0.09	1.74 ± 0.07	0.919	1.71 ± 0.04	1.74 ± 0.08	0.245
40m sprint (s)	5.47 ± 0.29	5.73 ± 0.34	**0.002****	5.39 ± 0.21	5.33 ± 0.26	0.453	5.23 ± 0.17	5.36 ± 0.23	0.101
DL Agility (s)	8.90 ± 0.53	8.57 ± 0.24	**0.041****	8.53 ± 0.60	8.29 ± 0.30	0.253	7.98 ± 0.29	8.39 ± 0.46	**0.049****
NDL Agility (s)	9.09 ± 0.48	8.76 ± 0.35	**0.044****	8.64 ± 0.61	8.52 ± 0.28	0.564	8.17 ± 0.27	8.58 ± 0.44	**0.042****
Momentum (kg/ms)	494 ± 78.5	457 ± 77.2	0.062	571 ± 52.6	529 ± 59.5	**0.027****	602 ± 50.8	551 ± 59.2	**0.015****
Power (w)	4845 ± 768.4	4477 ± 757.7	0.062	5594 ± 516.5	5181 ± 583.3	**0.026****	5901 ± 496.5	5399 ± 580.5	**0.016****
PAP (w)	3952 ± 845.4	3822 ± 609.7	0.488	4719 ± 508.1	4531 ± 455.6	0.221	6916 ± 227.0	4627 ± 486.5	**0.000****

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 2: The Psychological Results (Mean ± Standard Deviation) of Regional and Club Age Grade Players in each age-category

The Team	UNDER 16s			UNDER 18s			Elite Under 18s		
	REGIONAL (*n* = 80)	**CLUB (*n* = 66)**	***P***	**REGIONAL (n =49)**	**CLUB (*n* = 33)**	***P***	**Elite (*n* =31)**	**Under 18s (*n* = 82)**	***P***
Outcome Focus	8.5 ± 1.5	8.4 ± 1.3	0.751	8.6 ± 1.3	8.4 ± 1.6	0.674	8.8 ± 1.5	8.5 ± 1.4	0.331
Mastery Focus	9.2 ± 1.2	9.1 ± 1.2	0.732	9.0 ± 1.1	8.8 ± 1.3	0.467	9.2 ± 1.0	9.0 ± 1.2	0.409
Commitment	8.5 ± 1.0	8.3 ± 1.2	0.189	7.8 ± 1.3	7.8 ± 1.0	0.889	7.4 ± 1.2	7.8 ± 1.2	0.138
Athlete Burnout	28.1 ± 5.2	29.9 ± 6.9	0.083	30.1 ± 6.3	33.2 ± 7.0	**0.045****	32.2 ± 6.5	31.4 ± 6.7	0.566
Exhaustion	8.8 ± 2.6	9.8 ± 3.3	0.059	9.5 ± 2.8	10.7 ± 3.3	0.096	11.1 ± 2.9	10.0 ± 3.0	0.074
RS. Accomplishment	11.7 ± 3.0	12.3 ± 3.1	0.277	12.6 ± 2.7	13.2 ± 2.8	0.339	12.7 ± 2.9	12.8 ± 2.7	0.874
Sport Devaluation	7.6 ± 2.4	7.8 ± 2.5	0.487	8.1 ± 2.5	9.4 ± 3.1	**0.038****	8.4 ± 2.7	8.6 ± 2.8	0.686
Life Stress	6.4 ± 2.6	7.0 ± 2.5	0.148	7.3 ± 2.1	7.3 ± 2.3	0.917	7.7 ± 2.6	7.3 ± 2.2	0.433
Training stress	6.2 ± 2.2	6.8 ± 2.6	0.156	7.2 ± 2.3	6.8 ± 2.3	0.491	8.0 ± 2.6	7.1 ± 2.3	0.061
Athlete Identity	7.0 ± 1.7	6.7 ± 1.6	0.246	6.1 ± 1.9	6.7 ± 1.8	0.164	6.2 ± 2.0	6.4 ± 1.8	0.630
Optimism	14.6 ± 2.2	14.0 ± 2.3	0.110	13.9 ± 2.2	13.9 ± 2.7	0.962	15.1 ± 2.3	13.9 ± 2.4	**0.018****
Alexithymia	14.8 ± 2.9	15.3 ± 3.0	0.285	14.5 ± 0.51	15.1 ± 0.62	0.488	15.2 ± 0.61	14.8 ± 0.37	0.570
Difficulty Identifying Feelings	4.7 ± 1.7	4.7 ± 1.7	0.911	3.9 ± 0.24	4.4 ± 0.29	0.236	4.6 ± 0.29	4.1 ± 0.18	0.140
Difficulty Describing Feelings	4.6 ± 1.8	4.7 ± 1.7	0.658	4.1 ± 0.31	4.9 ± 0.37	0.103	4.8 ± 0.36	4.5 ± 0.22	0.402
Externally Orientated Feelings	5.6 ± 1.4	5.9 ± 1.7	0.164	5.8 ± 0.28	5.8 ± 0.28	0.985	5.7 ± 0.33	5.8 ± 0.20	0.941
Perfectionistic Concerns	13.5 ± 3.4	13.2 ± 3.2	0.554	13.6 ± 2.8	13.0 ± 2.3	0.295	13.7 ± 2.9	13.3 ± 2.6	0.500
Perfectionistic Striving	7.2 ± 1.3	6.7 ± 1.3	**0.029****	6.3 ± 1.2	6.5 ± 1.4	0.476	7.1 ± 1.2	6.4 ± 1.3	**0.007****
Self-Esteem	13.8 ± 2.7	13.8 ± 2.0	0.971	13.6 ± 2.5	13.8 ± 1.8	0.669	13.6 ± 2.7	13.7 ± 2.2	0.779
Extraversion	9.4 ± 2.2	9.0 ± 1.9	0.244	9.0 ± 1.9	8.9 ± 2.2	0.770	9.1 ± 2.1	9.0 ± 2.0	0.800
Agreeableness	9.0 ± 1.9	9.0 ± 2.0	0.896	8.9 ± 1.5	9.6 ± 2.1	0.064	8.5 ± 1.8	9.2 ± 1.8	0.083
Conscientiousness	9.6 ± 2.5	9.3 ± 2.4	0.577	9.2 ± 2.5	8.6 ± 2.7	0.305	9.3 ± 2.5	8.9 ± 2.5	0.461
Emotional Stability	9.5 ± 2.4	9.4 ± 2.5	0.743	9.2 ± 2.4	9.0 ± 2.3	0.643	9.4 ± 2.5	9.1 ± 2.3	0.545
Openness	9.6 ± 2.4	9.7 ± 2.1	0.760	9.8 ± 1.9	9.0 ± 1.9	0.067	9.3 ± 2.1	9.5 ± 2.0	0.700
Amotivation	3.1 ± 1.4	5.7 ± 12.9	0.287	3.2 ± 1.5	2.8 ± 1.1	0.369	3.6 ± 1.9	3.0 ± 1.1	0.207
External Regulation	3.4 ± 1.6	3.4 ± 2.0	0.914	3.5 ± 2.0	2.6 ± 1.0	0.139	3.1 ± 1.4	3.4 ± 2.1	0.638
Introjected Regulation	3.9 ± 2.2	4.7 ± 3.3	0.223	4.6 ± 2.8	3.8 ± 2.0	0.298	5.0 ± 3.3	3.8 ± 2.4	0.180
Identified Regulation	10.9 ± 2.0	11.2 ± 2.2	0.663	11.0 ± 1.7	10.6 ± 3.4	0.705	11.3 ± 1.9	10.3 ± 3.1	0.304
Integrated Regulation	10.2 ± 2.3	11.1 ± 2.4	0.129	10.1 ± 2.3	11.4 ± 2.5	0.122	10.7 ± 1.9	10.2 ± 2.6	0.534
IM-General	12.5 ± 1.5	12.5 ± 2.9	0.899	12.4 ± 1.8	12.9 ± 1.0	0.244	12.9 ± 1.6	12.6 ± 1.4	0.532
Resilience	21.4 ± 2.8	22.2 ± 3.3	0.256	21.2 ± 2.9	22.6 ± 4.0	0.249	20.2 ± 2.9	21.6 ± 2.6	0.122
Emotional Intelligence	45.4 ± 4.8	45.5 ± 4.2	0.894	45.2 ± 5.8	43.1 ± 4.9	0.293	45.3 ± 5.7	44.5 ± 5.5	0.645
Appraisal of Own Emotions	7.2 ± 1.8	7.3 ± 1.7	0.808	7.4 ± 1.5	6.9 ± 1.1	0.313	7.4 ± 1.1	7.3 ± 1.1	0.634
Appraisal of Others Emotions	7.5 ± 1.2	7.5 ± 1.3	0.972	7.8 ± 1.3	7.8 ± 1.6	0.867	7.5 ± 1.2	7.8 ± 1.4	0.485
Regulation of Own Emotions	8.1 ± 1.3	8.2 ± 1.4	0.707	7.7 ± 1.3	7.5 ± 1.2	0.643	7.9 ± 1.1	7.6 ± 1.2	0.521
Regulation of Others Emotions	7.0 ± 1.1	7.1 ± 1.1	0.664	7.3 ± 1.4	7.3 ± 1.5	0.936	7.3 ± 1.2	7.3 ± 1.4	0.947
Utilisation of Emotions	8.2 ± 1.1	8.1 ± 0.98	0.778	7.7 ± 1.3	6.9 ± 1.3	0.090	7.8 ± 1.7	7.4 ± 1.3	0.480
Coping Strategies	28.2 ± 5.3	6.5 ± 5.1	0.160	25.2 ± 4.0	29.9 ± 4.6	**.010****	5.6 ± 4.6	26.7 ± 4.7	0.456
Coping with Adversity	4.1 ± 1.2	3.7 ± 1.4	0.151	3.7 ± 1.2	4.1 ± 1.2	0.397	4.1 ± 1.3	3.8 ± 1.2	0.434
Performing Under Pressure	3.9 ± 1.2	3.8 ± 1.3	0.763	3.8 ± 1.3	4.6 ± 1.1	0.145	3.9 ± 1.5	4.0 ± 1.3	0.811
Mental Preparation	3.4 ± 1.3	3.2 ± 1.4	0.455	2.7 ± 1.6	3.7 ± 1.5	0.148	2.8 ± 1.6	3.0 ± 1.6	0.631
Concentration	4.4 ± 1.1	4.2 ± 1.2	0.509	3.9 ± 0.71	4.9 ± 0.78	**0.004****	3.8 ± .97	4.3 ± 0.84	0.118
Free from Worry	3.2 ± 1.4	3.3 ± 1.3	0.740	2.7 ± 1.2	3.4 ± 1.1	0.134	2.9 ± 1.4	2.9 ± 1.2	1.000
Achievement Motivation	4.1 ± 1.1	3.5 ± 1.1	**0.040****	3.4 ± .96	3.9 ± 0.93	0.186	3.7 ± 1.2	3.5 ± 0.96	0.605
Coachability	5.1 ± 1.1	4.7 ± 1.2	0.191	5.0 ± 1.2	5.3 ± 1.0	0.464	4.3 ± .73	5.1 ± 1.1	**0.016****

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 3: The psychological results (Mean ± Standard Deviation) of Regional and Club Age Grade Forwards in each age-category

Age Grade Forwards	**UNDER 16s**			**UNDER 18s**			**Elite Under 18s**		
	REGIONAL (*n* = 44)	**CLUB (*n* = 35)**	***P***	**REGIONAL (n =26)**	**CLUB (*n* = 12)**	***P***	**ELITE (*n* =19)**	**Under 18s (*n = 38)***	***P***
Outcome Focus	8.3 ± 1.6	8.3 ± 1.3	0.960	8.7 ± 1.5	9.2 ± 0.83	0.304	9.1 ± 1.4	8.8 ± 1.3	0.573
Mastery Focus	9.2 ± 1.4	9.1 ± 1.4	0.752	9.0 ± 1.2	9.1 ± 1.0	0.910	9.5 ± 0.70	9.0 ± 1.1	0.096
Commitment	8.4 ± 0.88	8.2 ± 1.1	0.387	7.8 ± 1.1	7.9 ± 0.90	0.696	7.6 ± 1.0	7.8 ± 1.1	0.424
Athlete Burnout	27.9 ± 5.8	29.9 ± 6.6	0.157	29.2 ± 5.2	32.4 ± 5.9	0.088	30.2 ± 5.7	29.5 ± 6.2	0.674
Exhaustion	8.5 ± 2.6	9.5 ± 3.0	0.136	9.0 ± 2.6	10.3 ± 2.3	0.172	9.9 ± 2.4	9.4 ± 2.6	0.500
RS. Accomplishment	11.8 ± 3.0	12.7 ± 3.0	0.214	12.1 ± 2.5	13.4 ± 3.0	0.173	12.3 ± 3.2	12.5 ± 2.7	0.798
Sport Devaluation	7.5 ± 2.6	7.7 ± 2.5	0.722	8.0 ± 2.3	8.8 ± 2.5	0.348	8.2 ± 2.4	7.3 ± 2.1	0.146
Life Stress	6.2 ± 2.7	7.5 ± 2.8	0.053	7.5 ± 2.5	7.0 ± 1.9	0.525	7.1 ± 2.3	7.4 ± 2.3	0.698
Training stress	6.0 ± 2.3	6.9 ± 2.9	0.127	7.0 ± 2.8	6.4 ± 2.1	0.485	7.3 ± 2.4	6.8 ± 2.6	0.548
Athlete Identity	7.0 ± 1.6	7.0 ± 1.3	0.960	6.6 ± 1.5	6.6 ± 2.4	0.960	6.5± 1.9	6.6 ± 1.8	0.798
Optimism	14.3 ± 2.2	13.7 ± 2.6	0.270	14.2 ± 1.9	14.8 ± 2.5	0.486	15.8 ± 1.9	14.4 ± 2.1	**0.019****
Alexithymia	14.9 ± 2.6	16.1 ± 2.9	0.052	16.1 ± 2.6	13.9 ± 3.1	**0.033****	14.7 ± 2.8	15.4 ± 2.9	0.401
Difficulty Identifying Feelings	4.6 ± 1.9	5.1 ± 1.8	0.252	4.4 ± 1.7	3.8 ± 1.2	0.291	4.7 ± 1.2	4.2 ± 1.5	0.300
Difficulty Describing Feelings	4.5 ± 1.7	4.9 ± 2.0	0.357	4.8 ± 1.6	3.9 ± 1.9	0.143	4.6 ± 1.4	4.5 ± 1.7	0.885
Externally Orientated Feelings	5.8 ± 1.4	5.9 ± 1.8	0.602	6.1 ± 1.5	6.1 ± 1.21	0.988	5.4 ± 1.5	6.1 ± 1.4	0.133
Perfectionistic Concerns	13.4 ± 3.6	13.7 ± 3.3	0.679	13.6 ± 2.6	2.5 ± 2.4	0.213	13.1 ± 2.8	13.3 ± 2.5	0.831
Perfectionistic Striving	7.2 ± 1.4	6.7 ± 1.4	0.184	7..2 ± 1.3	6.6 ± 1.4	0.285	7.2 ± 1.3	6.3 ± 1.2	**0.008****
Self-Esteem	13.4 ± 2.9	14.1 ± 2.0	0.265	13.9 ± 2.5	14.3 ± 1.1	0.663	13.4 ± 2.6	14.0 ± 2.1	0.347
Extraversion	9.3 ± 2.3	8.7 ± 1.6	0.202	8.8 ± 1.9	8.9 ± 3.0	0.892	9.8 ± 2.2	8.8 ± 2.0	0.116
Agreeableness	9.0 ± 1.8	9.4 ± 2.0	0.408	8.9 ± 1.6	9.7 ± 2.3	0.259	8.7 ± 1.3	9.2 ± 1.9	0.329
Conscientiousness	9.7 ± 2.7	9.2 ± 2.5	0.468	8.8 ± 2.3	7.2 ± 2.6	0.060	9.6 ± 2.9	8.3 ± 2.5	0.087
Emotional Stability	9.6 ± 2.5	9.2 ± 2.5	0.408	9.2 ± 2.3	9.23 ± 2.8	0.838	9.4 ± 2.7	9.2 ± 2.5	0.770
Openness	9.3 ± 2.3	9.3 ± 2.0	0.942	9.9 ± 1.9	8.9 ± 2.2	0.183	9.8 ± 2.0	9.6 ± 2.0	0.667
Amotivation	3.2 ± 1.3	7.6 ± 7.4	0.411	3.5 ± 1.6	2.7 ± 0.76	0.281	3.5 ± 1.4	3.3 ± 1.2	0.960
External Regulation	3.4 ± 1.6	3.4 ± 2.0	0.960	3.7 ± 2.2	2.3 ± 0.49	0.110	2.9 ± 1.3	3.5 ± 2.1	0.274
Introjected Regulation	4.5 ± 2.8	4.6 ± 2.4	0.905	4.5 ± 2.6	3.7 ± 1.7	0.464	4.0 ± 2.3	4.2 ± 2.6	0.667
Identified Regulation	10.8 ± 1.5	10.9 ± 2.2	0.912	11.2 ± 1.8	10.6 ± 4.4	0.681	12.1 ± 1.4	10.9 ± 3.0	0.256
Integrated Regulation	8.8 ± 1.8	11.0 ± 2.5	**0.010****	10.2 ± 2.8	11.6 ± 2.7	0.308	11.2 ± 2.1	10.7 ± 2.6	0.804
IM-General	12.3 ± 1.8	12.3 ± 2.9	0.686	12.5 ± 1.4	13.0 ± 0.82	0.460	13.1 ± 0.73	12.9 ± 0.87	0.654
Resilience	20.6 ± 2.9	22.0 ± 3.6	0.278	21.5 ± 2.8	23.7 ± 3.3	0.149	21.6 ± 2.2	21.8 ± 3.1	0.850
Emotional Intelligence	44.8 ± 5.1	45.1 ± 4.3	0.823	45.2 ± 5.3	45.8 ± 2.1	0.848	47.1 ± 3.9	45.3 ± 4.7	0.323
Appraisal of Own Emotions	6.9 ± 2.1	7.1 ± 1.5	0.741	7.3 ± 1.5	7.3 ± 1.0	0.965	8.0 ± 0.5	7.3 ± 1.4	0.119
Appraisal of Others Emotions	7.5 ± 1.3	7.7. ± 1.5	0.535	7.6 ± 1.2	8.3 ± 0.5	0.352	7.6 ± 1.2	7.8 ± 1.1	0.695
Regulation of Own Emotions	8.3 ± 1.4	8.0 ± 1.5	0.543	7.8 ± 1.1	8.5 ± 0.6	0.217	8.1 ± 0.9	7.9 ± 1.0	0.684
Regulation of Others Emotions	6.8 ± 1.7	7.0 ± 1.0	0.758	7.6 ± 1.3	7.3 ± 1.3	0.675	7.4 ± 1.3	7.5 ± 1.3	0.845
Utilisation of Emotions	8.0 ± 1.0	8.0 ± 1.0	0.882	7.9 ± 1.1	7.8 ± 0.5	0.855	8.4 ± 0.8	7.8 ± 1.0	0.138
Coping Strategies	28.1 ± 5.2	27.1 ± 5.2	0.568	24.7 ± 4.4	31.5 ± 5.1	**0.024****	26.7 ± 4.0	26.5 ± 5.4	0.949
Coping with Adversity	4.3 ± 1.3	3.9 ± 1.5	0.434	3.7 ± 1.3	4.8 ± 1.3	0.191	4.3 ± 1.4	4.0 ± 1.3	0.564
Performing Under Pressure	4.0 ±1.2	4.1 ± 1.2	0.784	3.6 ± 1.4	5.0 ± 1.4	0.126	4.1 ± 1.3	4.0 ± 1.5	0.855
Mental Preparation	3.1 ± 1.1	3.2 ± 1.3	0.648	2.6 ± 1.6	4.3 ± 1.3	0.098	2.6 ± 1.2	3.1 ± 1.7	0.435
Concentration	4.2 ± 1.2	4.5 ± 1.3	0.433	4.0 ± 0.63	5.3 ± 0.96	**0.011****	4.1 ± 0.90	4.3 ± 0.90	0.568
Free from Worry	3.5 ± 1.3	3.1 ± 1.1	0.333	2.8 ± 1.3	2.8 ± 1.3	0.930	3.1 ± 1.6	2.8 ± 1.3	0.604
Achievement Motivation	4.1 ± 1.0	3.4 ± 0.94	**0.041****	3.3± 0.90	4.0 ± 0.82	0.183	4.1 ± 0.93	3.5 ± 0.92	0.111
Coachability	5.0 ± 1.1	4.8 ± 1.2	0.652	4.6 ± 1.3	5.5 ± 1.0	0.249	4.3 ± 0.87	4.7 ± 1.1	0.272

Key: *P* = p-value <.005; ** Statistically Significant; n = Number of Participants; ± = Mean & Standard Deviation

Table 4: The Physiological and psychological Results (Mean ± Standard Deviation) of Regional and Club Age Grade Backs in each age-category

Age Grade Backs	UNDER 16s			UNDER 18s			Elite Under 18s		
	REGIONAL (*n* = 36)	CLUB (*n* = 31)	*P*	REGIONAL (n =23)	CLUB (*n* = 21)	*P*	Elite (*n* =11)	Under 18s (*n* = *44)*	*P*
Outcome Focus	8.6 ± 1.3	8.5 ± 1.2	0.555	8.4 ± 1.1	8.0 ± 1.8	0.379	8.9 ± 1.4	8.2 ± 1.5	0.409
Mastery Focus	9.2 ± 0.92	9.2 ± 0.97	0.886	9.0 ± 1.0	8.7 ± 1.4	0.380	8.7 ± 1.2	8.9 ± 1.2	0.704
Commitment	8.6 ± 1.1	8.3 ± 1.2	0.319	7.7 ± 1.5	7.7 ± 1.1	0.974	7.2 ± 1.5	7.7 ± 1.3	0.241
Athlete Burnout	28.4 ± 4.5	29.9 ± 7.3	0.320	31.4 ± 7.4	33.6 ± 7.7	0.333	36.0 ± 4.2	32.5 ± 7.5	0.142
Exhaustion	9.2 ± 2.5	10.1 ± 3.7	0.242	10.1 ± 3.1	10.9 ± 3.7	0.438	13.0 ± 2.6	10.5 ± 3.4	**0.026****
RS. Accomplishment	11.6 ± 3.0	11.8 ± 3.2	0.793	13.1 ± 2.8	13.0 ± 2.7	0.914	13.4 ± 2.3	13.0 ± 2.7	0.723
Sport Devaluation	7.7 ± 2.1	8.0 ± 2.4	0.508	8.2 ± 2.7	9.7 ± 3.4	0.105	9.6 ± 2.5	8.9 ± 3.1	0.487
Life Stress	6.6 ± 2.5	6.5 ± 2.0	0.875	7.0 ± 1.7	7.4 ± 2.4	0.460	8.6 ± 2.9	7.2 ± 2.1	0.064
Training stress	6.5 ± 2.0	6.7 ± 2.3	0.761	7.3 ± 1.5	7.1 ± 2.5	0.774	9.2 ± 1.6	7.2 ± 2.0	**0.006****
Athlete Identity	6.9 ± 1.8	6.3 ± 1.8	0.144	5.5 ± 2.1	6.8 ± 1.5	**0.024****	6.0 ± 1.9	6.1 ± 1.9	0.850
Optimism	15.1 ± 2.2	14.4 ± 1.9	0.205	13.5 ± 2.5	13.5 ± 2.7	0.977	13.9 ± 2.6	13.5 ± 2.6	0.633
Alexithymia	14.7 ± 3.3	14.5 ± 3.0	0.766	12.8 ± 3.8	16.0 ± 3.4	**0.006****	15.8 ± 2.3	14.4 ± 2.9	0.223
Difficulty Identifying Feelings	4.7 ± 1.5	4.2 ± 1.4	0.180	3.4 ± 2.0	4.8 ± 1.2	**0.008****	4.5 ± 1.4	4.0 ± 1.8	0.420
Difficulty Describing Feelings	4.6 ± 2.0	4.4 ± 1.5	0.726	3.4 ± 2.2	5.6 ± 2.2	**0.002****	5.2 ± 1.7	4.5 ± 2.5	0.376
Externally Orientated Feelings	5.3 ± 1.3	5.9 ± 1.6	0.117	5.4 ± 2.8	5.6 ± 1.7	0.766	6.2 ± 1.5	5.5 ± 2.3	0.350
Perfectionistic Concerns	13.6 ± 3.2	12.5 ± 3.0	0.167	13.6 ± 3.0	13.2 ± 2.2	0.708	15.1 ± 2.5	13.4 ± 2.6	0.060
Perfectionistic Striving	7.2 ± 1.1	6.6 ± 1.3	0.074	6.5 ± 1.5	6.5 ± 1.4	0.958	7.1 ± 1.2	6.5 ± 1.4	0.204
Self-Esteem	14.3 ± 2.3	13.5 ± 1.9	0.142	13.3 ± 2.6	13.6 ± 2.1	0.613	14.1 ± 2.0	13.4 ± 2.3	0.439
Extraversion	9.6 ± 2.1	9.4 ± 2.1	0.697	9.4 ± 1.9	8.9 ± 1.6	0.422	7.9 ± 1.5	9.1 ± 1.7	**0.041****
Agreeableness	8.9 ± 2.1	8.6 ± 2.0	0.547	8.8 ± 1.5	9.6 ± 2.0	0.147	8.2 ± 2.5	9.2 ± 1.8	0.126
Conscientiousness	9.4 ± 2.4	9.5 ± 2.2	0.990	9.7 ± 2.6	9.4 ± 2.4	0.730	9.0 ± 2.0	9.5 ± 2.5	0.527
Emotional Stability	9.4 ± 2.4	9.6 ± 2.6	0.676	9.3 ± 2.5	8.8 ± 1.9	0.442	9.4 ± 2.3	9.0 ± 2.2	0.655
Openness	10.1 ± 2.4	10.2 ± 2.2	0.763	9.8 ± 2.0	9.0 ± 1.8	0.247	8.4 ± 2.2	9.4 ± 1.9	0.131
Amotivation	3.1 ± 1.5	3.4 ± 2.1	0.610	2.7 ± 1.3	2.9 ±1.3	0.771	3.6 ± 2.6	2.8 ± 1.2	0.347
External Regulation	3.4 ± 1.6	3.3 ± 2.0	0.834	2.9 ± 1.6	2.9 ± 1.2	0.950	4.1 ± 2.9	2.9 ± 1.3	0.152
Introjected Regulation	3.5 ± 1.6	4.9 ± 3.3	0.122	5.1 ± 3.2	3.8 ± 2.3	0.327	7.6 ± 3.8	3.5 ± 2.1	**0.011****
Identified Regulation	11.0 ± 2.6	11.5 ± 2.3	0.544	10.1 ± 2.0	10.7 ± 2.9	0.663	9.0 ± 3.9	10.5 ± 2.5	0.277
Integrated Regulation	10.9 ± 2.2	11.3 ± 2.3	0.648	9.4 ± 1.5	11.2 ± 2.4	0.110	10.4 ± 2.9	10.5 ± 2.2	0.970
IM-General	12.7 ± 1.3	12.6 ± 2.9	0.960	11.6 ± 2.4	12.9 ± 1.2	0.155	12.4 ± 1.6	12.4 ± 1.9	0.926
Resilience	21.8 ± 2.7	22.6 ± 2.9	0.416	20.5 ± 3.1	21.8 ± 4.5	0.547	22.3 ± 3.9	21.3 ± 4.0	0.594
Emotional Intelligence	46.1 ±4.5	46.0 ± 4.2	0.971	45.1 ± 6.8	41.8 ± 5.4	0.273	42.2 ± 7.2	43.6 ± 6.3	0.642
Appraisal of Own Emotions	7.5 ± 1.3	7.5 ± 1.9	0.995	7.6 ± 1.6	6.8 ± 1.2	0.223	6.5 ± 1.2	7.2 ± 1.4	0.283
Appraisal of Others Emotions	7.6 ± 1.3	7.3 ± 1.2	0.410	7.9 ± 1.4	7.6 ± 1.9	0.733	7.3 ± 1.2	7.8 ± 1.6	0.548
Regulation of Own Emotions	7.8 ± 1.2	8.4 ± 1.2	0.154	7.6 ± 1.6	7.3 ± 1.4	0.387	7.5 ± 1.5	7.3 ± 1.4	0.808
Regulation of Others Emotions	7.2 ± 1.3	7.3 ± 1.1	0.739	7.3 ± 1.8	7.3 ± 1.8	0.656	7.0 ± 1.3	7.1 ± 1.6	0.939
Utilisation of Emotions	8.4 ± 1.0	8.2 ± 1.0	0.574	7.5 ± 1.5	6.5 ± 1.4	0.170	6.7 ± 2.2	7.1 ± 1.5	0.629
Coping Strategies	28.7 ± 4.8	24.9 ± 4.5	**0.021****	25.9 ± 3.4	28.6 ± 4.4	0.236	23.6 ± 5.4	26.9 ± 3.9	0.163
Coping with Adversity	4.0 ± 1.1	3.4 ± 1.2	0.170	3.6 ± 1.2	3.6 ± 1.1	0.971	3.8 ± 1.1	3.6 ± 1.1	0.757
Performing Under Pressure	3.8 ± 1.3	3.5 ± 1.3	0.467	4.0 ± 1.2	4.2 ± 0.84	0.751	3.6 ± 1.9	4.1 ± 1.0	0.504
Mental Preparation	3.8 ± 1.4	3.1 ± 1.5	0.178	2.9 ± 1.6	3.2 ± 1.6	0.726	3.2 ± 2.2	3.0 ± 1.5	0.827
Concentration	4.6 ± 1.0	3.9 ± 0.95	**0.033****	3.9 ± 0.83	4.6 ± 0.55	0.115	3.2 ± 0.84	4.2 ± 0.80	**0.040****
Free from Worry	2.8 ±1.5	3.5 ± 1.7	0.242.	2.5 ± 1.2	4.0 ± 0.71	**0.029****	2.6 ± 0.89	3.1 ± 1.3	0.452
Achievement Motivation	4.1 ± 1.3	3.6 ± 1.3	0.367	3.5 ± 1.1	3.8 ± 1.1	0.635	3.0 ± 1.4	3.6 ± 1.0	0.323
Coachability	5.2 ± 1.1	4.6 ± 1.1	0.157	5.5 ± 0.76	5.2 ± 1.1	0.568	4.2 ± 0.45	5.4 ± 0.87	**0.011****

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 5: The Physiological and psychological differences (Mean ± Standard Deviation) of Elite Under 18s and Regional Under 18s

Elite Under 18s Comparison	Total			Forwards			Backs		
	Elite (*n* = 31)	**Regional (*n* = 49)**	***P***	**Elite (n =19)**	**Regional (*n* = 26)**	***P***	**Elite (*n* =11)**	**Regional (*n = 23)***	***P***
Height (cm)	181.0 ± 6.1	179.9 ± 5.6	0.394	182.0 ± 7.1	181.7 ± 5.9	0.903	180.5 ± 4.1	177.8 ± 4.7	0.118
Weight (kg)	87.2 ± 11.2	84.6 ± 13.7	0.379	94.1 ± 13.8	91.5 ± 14.9	0.889	79.7 ± 7.2	76.8 ± 6.1	0.234
Countermovement Jump (cm)	53.0 ± 7.8	51.7 ± 7.9	0.360	51.4 ± 8.3	49.3 ± 7.1	0.240	55.3 ± 6.4	54.4 ± 8.0	0.696
DH Grip Strength (kg)	49.8 ± 8.2	47.1 ± 6.5	0.161	51.3 ± 8.6	52.8 ± 5.7	0.225	46.8 ± 7.3	45.9 ± 5.0	0.939
NDH Grip Strength (kg)	47.4 ± 7.1	44.0 ± 6.5	0.053	47.6 ± 7.5	50.4 ± 7.4	0.237	47.1 ± 6.8	43.3 ± 4.6	0.111
10m Sprint (s)	1.78 ± 0.09	1.78 ± 0.09	0.688	1.82 ± 0.09	1.81 ± 0.08	0.637	1.71 ± 0.04	1.74 ± 0.09	0.272
40m sprint (s)	5.50 ± 0.30	5.52 ± 0.27	0.902	5.65 ± 0.27	5.63 ± 0.26	0.889	5.23 ± 0.17	5.39 ± 0.21	0.065
DL Agility (s)	8.29 ± 0.47	8.30 ± 0.27	0.657	8.52 ± 0.44	8.46 ± 0.37	0.730	7.98 ± 0.29	8.23 ± 0.24	0.075
NDL Agility (s)	8.43 ± 0.43	8.49 ± 0.26	0.607	8.63 ± 0.43	8.63 ± 0.36	0.993	8.17 ± 0.27	8.35 ± 0.24	0.167
Momentum (kg/ms)	632 ± 58.3	611 ± 82.8	0.276	661 ± 72.1	645 ± 89.2	0.966	602 ± 50.8	571 ± 52.6	0.167
Power (w)	6196 ± 571.5	5988 ± 811.6	0.279	6382 ± 545.2	6317 ± 873.8	0.965	5901 ± 496.5	5594 ± 516.5	0.172
PAP (w)	7162 ± 420.6	4902 ± 565.0	**0.000****	7293 ± 455.5	5062 ± 573.3	**0.000****	6916 ± 227.0	4719 ± 508.1	**0.000****
Outcome Focus	8.8 ± 1.5	8.6 ± 1.3	0.421	8.8 ± 1.3	8.7 ± 1.5	0.405	8.9 ± 1.4	8.4 ± 1.1	0.480
Mastery Focus	9.2 ± 1.0	9.0 ± 1.1	0.725	9.1 ± 1.1	9.0 ± 1.2	0.116	8.7 ± 1.2	9.0 ± 1.0	0.334
Commitment	7.4 ± 1.2	7.8 ± 1.3	0.240	7.8 ± 1.1	7.8 ± 1.1	0.567	7.2 ± 1.5	7.7 ± 1.5	0.397
Athlete Burnout	32.2 ± 6.5	30.1 ± 6.3	0.124	30.2 ± 5.5	29.2 ± 5.2	0.833	36.0 ± 4.2	31.4 ± 7.4	**0.039****
Exhaustion	11.1 ± 2.9	9.5 ± 2.8	**0.008****	9.4 ± 2.5	9.0 ± 2.6	0.261	13.0 ± 2.6	10.1 ± 3.1	**0.004****
RS. Accomplishment	12.7 ± 2.9	12.6 ± 2.7	0.787	12.5 ± 2.7	12.1 ± 2.5	0.817	13.4 ± 2.3	13.1 ± 2.8	0.780
Sport Devaluation	8.4 ± 2.7	8.1 ± 2.5	0.543	8.2 ± 2.4	8.0 ± 2.3	0.306	9.6 ± 2.5	8.2 ± 2.7	0.100
Life Stress	9.2 ± 2.3	9.4 ± 2.4	0.726	9.8 ± 2.4	9.6 ± 2.4	0.527	9.4 ± 2.5	9.1 ± 2.5	0.770
Training stress	9.0 ± 2.4	9.4 ± 2.7	0.625	9.4 ± 2.6	9.5 ± 2.5	0.379	9.5 ± 2.3	9.4 ± 3.0	0.663
Athlete Identity	6.2 ± 2.0	6.1 ± 1.9	0.845	6.6 ± 1.8	6.6 ± 1.5	0.781	6.0 ± 1.9	5.5 ± 2.1	0.408
Optimism	15.1 ± 2.3	13.9 ± 2.2	**0.020****	14.4 ± 2.1	14.2 ± 1.9	**0.010****	13.9 ± 2.6	13.5 ± 2.5	0.648
Alexithymia	15.3 ± 2.7	14.9 ± 2.9	0.578	15.0 ± 3.0	15.7 ± 2.6	0.370	15.6 ± 2.3	13.8 ± 3.1	0.125
Perfectionistic Concerns	13.7 ± 2.9	13.6 ± 2.8	0.585	13.3 ± 2.5	13.6 ± 2.6	0.531	15.1 ± 2.5	13.6 ± 3.0	**0.031****
Perfectionistic Striving	7.1 ± 1.2	6.3 ± 1.2	**0.004****	7.2 ± 1.3	6.2 ± 1.0	**0.003****	7.1 ± 1.2	6.5 ± 1.5	0.209
Self-Esteem	13.6 ± 2.7	13.6 ± 2.5	0.929	14.0 ± 2.1	13.9 ± 2.5	0.511	14.1 ± 2.0	13.3 ± 2.6	0.428
Extraversion	9.1 ± 2.1	9.0 ± 1.9	0.686	8.8 ± 2.2	8.8 ± 1.9	0.096	7.9 ± 1.5	9.4 ± 1.9	0.092
Agreeableness	8.5 ± 1.8	8.9 ± 1.5	0.412	9.2 ± 1.9	8.9 ± 1.6	0.599	8.2 ± 2.5	8.8 ± 1.5	0.446
Conscientiousness	9.3 ± 2.5	9.2 ± 2.5	0.677	8.3 ± 2.5	8.8 ± 2.3	0.326	9.0 ± 2.0	9.7 ± 2.6	0.617
Emotional Stability	9.4 ± 2.5	9.2 ± 2.4	0.559	9.2 ± 2.5	9.2 ± 2.3	0.727	9.4 ± 2.3	9.3 ± 2.5	0.674
Openness	9.3 ± 2.1	9.8 ± 1.9	0.415	9.6 ± 2.0	9.9 ± 1.9	0.943	8.4 ± 2.2	9.8 ± 2.0	0.155
Amotivation	3.6 ± 1.9	3.2 ± 1.5	0.334	3.2 ± 1.0	3.5 ± 1.6	0.920	3.6 ± 2.6	2.7 ± 1.3	0.227
External Regulation	3.1 ± 1.4	3.5 ± 2.0	0.357	3.5 ± 2.1	3.7 ± 2.2	0.133	4.1 ± 2.9	2.9 ± 1.6	0.749
Introjected Regulation	5.0 ± 3.3	4.6 ± 2.8	0.451	4.0 ± 2.6	4.5 ± 2.6	0.435	7.6 ± 3.8	5.1 ± 3.2	0.053
Identified Regulation	11.3 ± 1.9	11.0 ± 1.7	0.151	10.9 ± 3.0	11.2 ± 1.8	0.247	9.0 ± 3.9	10.1 ± 2.0	0.463
Integrated Regulation	10.7 ± 1.9	10.1 ± 2.3	0.157	10.9 ± 2.3	10.2 ± 2.8	0.596	10.4 ± 2.9	9.4 ± 1.5	0.108
IM-General	12.9 ± 1.6	12.4 ± 1.8	0.320	13.1 ± 0.88	12.5 ± 1.4	0.545	12.4 ± 1.6	11.6 ± 2.4	0.488
Resilience	20.2 ± 2.9	21.2 ± 2.9	0.364	21.3 ± 3.0	21.5 ± 2.8	0.258	22.3 ± 3.9	20.5 ± 3.1	**0.047****
Emotional Intelligence	46.4 ± 6.8	44.0 ± 5.1	0.754	45.6 ± 4.4	45.4 ± 4.6	0.500	45.7 ± 8.4	41.4 ± 5.5	0.684
Coping Strategies	25.6 ± 4.6	25.2 ± 4.0	0.810	26.5 ± 5.4	24.7 ± 4.4	0.320	23.6 ± 5.4	25.9 ± 3.4	0.367
Coping with Adversity	4.1 ± 1.3	3.7 ± 1.2	0.312	4.0 ± 1.3	3.7 ± 1.3	0.341	3.8 ± 1.1	3.6 ± 1.2	0.795
Performing Under Pressure	3.9 ± 1.5	3.8 ± 1.3	0.779	4.0 ± 1.5	3.6 ± 1.4	0.448	3.6 ± 1.9	4.0 ± 1.2	0.652
Mental Preparation	2.8 ± 1.6	2.7 ± 1.6	0.930	3.1 ± 1.7	2.6 ± 1.6	0.904	3.2 ± 2.2	2.9 ± 1.6	0.758
Concentration	3.8 ± 0.97	3.9 ± 0.71	0.584	4.3 ± 0.90	4.0 ± 0.63	0.754	3.2 ± 0.84	3.9 ± 0.83	0.184
Free from Worry	2.9 ± 1.4	2.7 ± 1.2	0.600	3.1 ± 1.6	2.8 ± 1.3	0.661	2.6 ± 0.89	2.5 ± 1.2	0.876
Achievement Motivation	3.7 ± 1.2	3.4 ± 0.96	0.364	4.1 ± 0.92	3.3± 0.90	0.056	3.0 ± 1.4	3.5 ± 1.1	0.482
Coachability	4.3 ± 0.73	5.0 ± 1.2	0.051	4.9 ± 1.2	4.6 ± 1.3	0.554	4.2 ± 0.45	5.5 ± 0.76	**0.005****

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 6: The Physiological and psychological differences (Mean ± Standard Deviation) of Elite Under 18s and Club Under 18s

Elite Under 18s Comparison	Total			Forwards			Backs		
	Elite (*n* = 31)	**Club (*n* = 33)**	***P***	**Elite (n =19)**	**Club (*n* = 12)**	***P***	**Elite (*n* =11)**	**Club (*n = 21)***	***P***
Height (cm)	181.0 ± 6.1	177.8 ± 7.1	0.056	182.0 ± 7.1	181.7 ± 6.6	0.922	180.5 ± 4.1	175.6 ± 6.5	**0.030****
Weight (kg)	87.2 ± 11.2	76.4 ± 11.0	**0.000****	94.1 ± 13.8	84.9 ± 11.3	0.089	79.7 ± 7.2	71.5 ± 7.2	**0.005****
Countermovement Jump (cm)	53.0 ± 7.8	52.9 ± 7.5	0.937	51.4 ± 8.3	47.6 ± 8.7	0.247	55.3 ± 6.4	55.8 ± 5.0	0.863
DH Grip Strength (kg)	49.8 ± 8.2	45.7 ± 5.6	**0.016****	51.3 ± 8.6	44.7 ± 5.5	**0.017****	47.1 ± 6.8	46.6 ± 6.0	0.838
NDH Grip Strength (kg)	47.4 ± 7.1	41.8 ± 5.1	**0.000****	47.6 ± 7.5	40.2 ± 2.9	**0.005****	46.8 ± 7.3	42.7 ± 5.7	**0.048****
10m Sprint (s)	1.78 ± 0.09	1.78 ± 0.10	0.725	1.82 ± 0.09	1.85 ± 0.12	0.448	1.71 ± 0.04	1.74 ± 0.07	0.293
40m sprint (s)	5.50 ± 0.30	5.51 ± 0.42	0.959	5.65 ± 0.27	5.83 ± 0.47	0.202	5.23 ± 0.17	5.33 ± 0.26	0.322
DL Agility (s)	8.29 ± 0.47	8.45 ± 0.47	0.349	8.46 ± 0.37	8.77 ± 0.60	0.395	7.98 ± 0.29	8.29 ± 0.30	0.051
NDL Agility (s)	8.43 ± 0.43	8.64 ± 0.43	0.175	8.63 ± 0.37	8.88 ± 0.61	0.379	8.17 ± 0.27	8.52 ± 0.28	**0.018****
Momentum (kg/ms)	632 ± 58.3	551 ± 68.3	**0.000****	661 ± 72.1	592 ± 66.5	**0.017****	602 ± 50.8	529 ± 59.5	**0.005****
Power (w)	6196 ± 571.5	5402 ± 668.4	**0.000****	6382 ± 545.2	5801 ± 650.4	**0.017****	5901 ± 496.5	5181 ± 583.3	**0.005****
PAP (w)	7162 ± 420.6	4594 ± 465.0	**0.000****	7293 ± 455.5	4709 ± 481.4	**0.000****	6916 ± 227.0	4531 ± 455.6	**0.000****
Outcome Focus	8.8 ± 1.5	8.4 ± 1.6	0.202	8.8 ± 1.3	9.2 ± 0.83	0.755	8.6 ± 1.6	8.0 ± 1.8	0.181
Mastery Focus	9.2 ± 1.0	8.8 ± 1.3	0.191	9.1 ± 1.1	9.1 ± 1.0	0.117	8.7 ± 1.2	8.7 ± 1.4	0.869
Commitment	7.4 ± 1.2	7.8 ± 1.0	0.291	7.8 ± 1.1	7.9 ± 0.90	0.571	7.2 ± 1.5	7.7 ± 1.1	0.401
Athlete Burnout	32.2 ± 6.5	33.2 ± 7.0	0.564	30.2 ± 5.5	32.4 ± 5.9	0.199	36.0 ± 4.2	33.6 ± 7.7	0.240
Exhaustion	11.1 ± 2.9	10.7 ± 3.3	0.542	9.4 ± 2.5	10.3 ± 2.3	0.602	13.0 ± 2.6	10.9 ± 3.7	0.051
RS. Accomplishment	12.7 ± 2.9	13.2 ± 2.8	0.537	12.5 ± 2.7	13.4 ± 3.0	0.407	13.4 ± 2.3	13.0 ± 2.7	0.767
Sport Devaluation	8.4 ± 2.7	9.4 ± 3.1	0.173	8.2 ± 2.4	8.8 ± 2.5	0.083	9.6 ± 2.5	9.7 ± 3.4	0.878
Life Stress	9.2 ± 2.3	10.3 ± 2.5	0.103	9.8 ± 2.4	10.1 ± 2.5	0.551	9.4 ± 2.5	10.5 ± 2.6	0.290
Training stress	9.0 ± 2.4	9.4 ± 2.9	0.673	9.4 ± 2.6	9.3 ± 3.0	0.689	9.5 ± 2.3	9.5 ± 3.0	0.762
Athlete Identity	6.2 ± 2.0	6.7 ± 1.8	0.218	6.6 ± 1.8	6.6 ± 2.4	0.602	6.0 ± 1.9	6.8 ± 1.5	0.304
Optimism	15.1 ± 2.3	13.9 ± 2.7	**0.033****	14.4 ± 2.1	14.8 ± 2.5	0.138	13.9 ± 2.6	13.5 ± 2.7	0.617
Alexithymia	15.3 ± 2.7	15.1 ± 3.5	0.991	15.0 ± 3.0	13.4 ± 3.2	0.295	15.6 ± 2.3	16.0 ± 3.4	0.742
Perfectionistic Concerns	13.7 ± 2.9	13.0 ± 2.3	0.230	13.3 ± 2.5	12.5 ± 2.4	0.763	15.1 ± 2.5	13.2 ± 2.2	**0.004****
Perfectionistic Striving	7.1 ± 1.2	6.5 ± 1.4	0.060	6.3 ± 1.1	6.6 ± 1.4	0.268	7.1 ± 1.2	6.5 ± 1.4	0.165
Self-Esteem	13.6 ± 2.7	13.8 ± 1.8	0.610	14.0 ± 2.1	14.3 ± 1.1	0.254	14.1 ± 2.0	13.6 ± 2.1	0.617
Extraversion	9.1 ± 2.1	8.9 ± 2.2	0.746	8.8 ± 2.2	8.9 ± 3.0	0.477	7.9 ± 1.5	8.9 ± 1.6	0.145
Agreeableness	8.5 ± 1.8	9.6 ± 2.1	**0.016****	9.2 ± 1.9	9.7 ± 2.3	0.065	8.2 ± 2.5	9.6 ± 2.0	0.084
Conscientiousness	9.3 ± 2.5	8.6 ± 2.7	0.437	8.3 ± 2.5	7.2 ± 2.6	0.075	9.0 ± 2.0	9.4 ± 2.4	0.669
Emotional Stability	9.4 ± 2.5	9.0 ± 2.3	0.405	9.2 ± 2.5	9.23 ± 2.8	0.984	9.4 ± 2.3	8.8 ± 1.9	0.365
Openness	9.3 ± 2.1	9.0 ± 1.9	0.449	9.6 ± 2.0	8.9 ± 2.2	0.221	8.4 ± 2.2	9.0 ± 1.8	0.393
Amotivation	3.6 ± 1.9	2.8 ± 1.1	0.296	3.2 ± 1.0	2.7 ± 0.76	0.725	3.6 ± 2.6	2.9 ±1.3	0.314
External Regulation	3.1 ± 1.4	2.6 ± 1.0	0.341	3.5 ± 2.1	2.3 ± 0.49	0.498	4.1 ± 2.9	2.9 ± 1.2	0.380
Introjected Regulation	5.0 ± 3.3	3.8 ± 2.0	0.078	4.0 ± 2.6	3.7 ± 1.7	0.480	7.6 ± 3.8	3.8 ± 2.3	**0.043****
Identified Regulation	11.3 ± 1.9	10.6 ± 3.4	0.684	10.9 ± 3.0	10.6 ± 4.4	0.455	9.0 ± 3.9	10.7 ± 2.9	**0.046****
Integrated Regulation	10.7 ± 1.9	11.4 ± 2.5	0.176	10.9 ± 2.3	11.6 ± 2.7	0.646	10.4 ± 2.9	11.2 ± 2.4	**0.041****
IM-General	12.9 ± 1.6	12.9 ± 1.0	0.668	13.1 ± 0.88	13.0 ± 0.82	0.952	12.4 ± 1.6	12.9 ± 1.2	0.575
Resilience	20.2 ± 2.9	22.6 ± 4.0	**0.043****	21.3 ± 3.0	23.7 ± 3.3	0.160	22.3 ± 3.9	21.8 ± 4.5	**0.026****
Emotional Intelligence	46.4 ± 6.8	44.7 ± 5.2	0.439	45.6 ± 4.4	46.6 ± 3.0	0.585	45.7 ± 8.4	43.4 ± 6.1	0.831
Coping Strategies	25.6 ± 4.6	29.9 ± 4.6	0.066	26.5 ± 5.4	31.5 ± 5.1	0.089	23.6 ± 5.4	28.6 ± 4.4	0.259
Coping with Adversity	4.1 ± 1.3	4.1 ± 1.2	0.801	4.0 ± 1.3	4.8 ± 1.3	0.606	3.8 ± 1.1	3.6 ± 1.1	0.456
Performing Under Pressure	3.9 ± 1.5	4.6 ± 1.1	0.366	4.0 ± 1.5	5.0 ± 1.4	0.283	3.6 ± 1.9	4.2 ± 0.84	0.715
Mental Preparation	2.8 ± 1.6	3.7 ± 1.5	0.183	3.1 ± 1.7	4.3 ± 1.3	**0.044****	3.2 ± 2.2	3.2 ± 1.6	0.972
Concentration	3.8 ± 0.97	4.9 ± 0.78	**0.015****	4.3 ± 0.90	5.3 ± 0.96	0.068	3.2 ± 0.84	4.6 ± 0.55	**0.034****
Free from Worry	2.9 ± 1.4	3.4 ± 1.1	0.454	3.1 ± 1.6	2.8 ± 1.3	0.701	2.6 ± 0.89	4.0 ± 0.71	**0.046****
Achievement Motivation	3.7 ± 1.2	3.9 ± 0.93	0.753	3.5 ± 0.92	4.0 ± 0.82	0.841	3.0 ± 1.4	3.8 ± 1.1	0.435
Coachability	4.3 ± 0.73	5.3 ± 1.0	**0.018****	4.9 ± 1.2	5.5 ± 1.0	0.055	4.2 ± 0.45	5.2 ± 1.1	0.193

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 7: Birthdate distribution effect on anthropometrics and physical performance differences (Mean ± Standard Deviation) in Age Grade Rugby Union

Under 16s	**Regional H1**	**Regional H2**	**Club H1**	**Club H2**	**Regional (H1 vs H2)**	***P***	**Club (H1 vs H2)**	***P***	**Regional Vs Club (H1 vs H1)**	***P***	**Regional Vs Club (H2 vs H2)**	***P***
Height (cm)	177.4 ± 5.8	175.49 ± 7.6	174.8 ± 6.5	172.8 ± 7.4	1.5 ± 1.5	0.915	2.0 ± 1.7	0.643	1.7 ± 1.5	0.703	4.6 ± 1.7	**0.035****
Weight (kg)	75.9 ± 11.8	76.2 ± 18.3	73.4 ± 14.1	67.4 ± 12.5	-1.1 ± 3.2	0.985	6.0 ± 3.5	0.303	2.1 ± 3.2	0.908	9.3 ± 3.5	**0.044****
Countermovement Jump (cm)	49.3 ± 6.7	45.2 ± 6.5	46.9 ± 7.0	45.5 ± 5.7	4.3 ± 1.6	**0.035****	1.1 ± 1.8	0.928	2.8 ± 1.6	0.306	-1.5 ± 1.8	0.829
Grip Strength DH (kg)	42.2 ± 5.5	39.0 ± 6.6	39.9 ± 6.5	37.3 ± 6.8	3.6 ± 1.5	0.088	3.5 ± 1.7	0.163	1.9 ± 1.5	0.623	1.8 ± 1.7	0.740
Grip Strength NDH (kg)	39.2 ± 6.0	35.7 ± 7.2	37.4 ± 6.4	34.4 ± 7.4	3.9 ± 1.6	0.078	4.2 ± 1.8	0.103	1.2 ± 1.7	0.878	1.5 ± 1.8	0.838
10m Sprint (s)	1.78 ± 0.07	1.85 ± 0.16	1.82 ± 0.10	1.86 ± 0.10	-0.07 ± 0.03	**0.028****	-0.04 ± 0.03	0.609	-0.04 ± 0.03	0.355	-0.00 ± 0.03	0.999
40m Sprint (s)	5.56 ± 0.28	5.75 ± 0.40	5.82 ± 0.42	5.83 ± 0.36	-0.21 ± 0.09	0.076	0.00 ± 0.09	1.000	-0.28 ± 0.08	**0.009****	-0.07 ± 0.09	0.900
Momentum (m/s. kg)	545 ± 78.9	532 ± 115.6	504 ± 82.2	463 ± 80.4	24.5 ± 20.3	0.628	42.6 ± 22.7	0.244	45.6 ± 20.8	0.130	63.7 ± 22.3	**0.026****
Agility DL (s)	8.51 ± 0.36	8.54 ± 0.36	8.87 ± 0.45	8.52 ± 0.34	-0.03 ± 0.13	0.994	0.35 ± 0.15	0.092	-0.36 ± 0.12	**0.023****	0.02 ± 0.15	0.999
Agility NDL (s)	8.64 ± 0.39	8.70 ± 0.42	9.03 ± 0.44	8.75 ± 0.42	-0.06 ± 0.14	0.972	0.29 ± 0.16	0.291	-0.40 ± 0.13	**0.023****	-0.05 ± 0.16	0.991
Power (w)	1600 ± 265.8	1632 ± 316.2	4943 ± 811.3	4539 ± 788.3	-18.7 ± 66.0	0.992	-4.8 ± 73.7	1.000	192.0 ± 67.4	**0.021****	210.6 ± 72.4	**0.022****
Peak Anaerobic Power (w)	4262 ± 786.0	4112 ± 908.1.	4119 ± 681.9	3739 ± 522.0	152.8 ± 207.1	0.882	189.5 ± 231.6	0.846	370.2 ± 221.7	0.303	407.0 ± 227.4	0.283
Under 18s	**Regional H1**	**Regional H2**	**Club H1**	**Club H2**	**Regional (H1 vs H2)**	***P***	**Club (H1 vs H2)**	***P***	**Regional Vs Club (H1 vs H1)**	***P***	**Regional Vs Club (H2 vs H2)**	***P***
Height (cm)	180.1 ± 5.8	180.2 ± 6.6	178.9 ± 7.2	177.6 ± 6.4	-0.03 ± 2.0	1.000	0.39 ± 2.0	0.998	2.0 ± 1.9	0.707	2.5 ± 2.1	0.640
Weight (kg)	84.3 ± 10.4	82.9 ± 16.0	80.5 ± 11.9	75.4 ± 9.6	1.5 ± 3.8	0.979	5.2 ± 3.9	0.539	3.7 ± 3.6	0.738	7.4 ± 4.0	**0.014****
Countermovement Jump (cm)	53.2 ± 7.9	52.9 ± 5.6	49.9 ± 8.2	52.6 ± 8.0	0.28 ± 2.7	1.000	2.8 ± 2.8	0.752	3.3 ± 2.6	0.578	0.25 ± 2.9	1.000
Grip Strength DH (kg)	48.5 ± 8.4	47.4 ± 4.7	44.9 ± 6.5	43.5 ± 4.7	1.1 ± 2.3	0.967	1.5 ± 2.4	0.928	3.5 ± 2.2	0.394	3.9 ± 2.5	0.400
Grip Strength NDH (kg)	45.4 ± 9.3	45.1 ± 6.8	41.4 ± 5.2	39.6 ± 4.9	0.28 ± 2.5	0.999	1.8 ± 2.6	0.897	4.0 ± 2.4	0.355	5.5 ± 2.7	0.183
10m Sprint (s)	1.78 ± 0.07	1.76 ± 0.08	1.80 ± 0.12	1.79 ± 0.10	0.02 ± 0.03	0.920	0.01 ± 0.03	0.995	-0.02 ± 0.03	0.943	-0.03 ± 0.04	0.829
40m Sprint (s)	5.52 ± 0.23	5.47 ± 0.25	5.61 ± 0.49	5.53 ± 0.33	0.05 ± 0.12	0.975	0.08 ± 0.12	0.912	-0.09 ± 0.11	0.842	-0.06 ± 0.13	0.961
Momentum (m/s. kg)	615 ± 60.3	612 ± 100.7	562 ± 73.6	535 ± 58.6	2.5 ± 23.8	1.000	27.2 ± 30.1	0.803	52.5 ± 25.4	0.510	77.3 ± 28.8	**0.044****
Agility DL (s)	8.33 ± 0.31	8.39 ± 0.36	8.48 ± 0.55	8.40 ± 0.32	-0.07 ± 0.17	0.981	0.08 ± 0.19	0.974	-0.16 ± 0.16	0.767	-0.01 ± 0.20	1.000
Agility NDL (s)	8.50 ± 0.34	8.50 ± 0.34	8.74 ± 0.49	8.49 ± 0.29	0.00 ± 0.16	1.000	0.25 ± 0.18	0.531	-0.25 ± 0.15	0.383	0.001 ± 0.19	1.000
Power (w)	6023 ± 590.7	5999 ± 986.6	5508 ± 720.1	5230 ± 573.3	24.1 ± 232.8	1.000	267.4 ± 295.2	0.802	515.0 ± 248.9	0.174	758.3 ± 281.8	**0.043****
Peak Anaerobic Power (w)	5109 ± 566.1	4160 ± 1318.9	4731 ± 415.4	4403 ± 477.8	50.5 ± 155.9	0.988	328.2 ± 190.3	0.319	195.1 ± 164.6	0.638	472.8 ± 182.9	0.056
Elite Under 18s	**Elite H1**	**Elite H2**	**Under 18s H1**	**Under 18s H2**	**Elite (H1 vs H2)**	***P***	**Under 18s (H1 vs H2)**	***P***	**Elite Vs Under 18s (H1 vs H1)**	***P***	**Elite Vs Under 18s (H2 vs H2)**	***P***
Height (cm)	182.7 ± 5.5	178.2 ± 6.2	179.2 ± 6.1	178.8 ± 6.6	4.4 ± 2.3	0.233	0.44 ± 1.4	0.989	3.5 ± 1.7	0.168	-0.53 ± 2.1	0.994
Weight (kg)	87.8 ± 9.8	88.9 ± 18.6	82.7 ± 11.0	78.8 ± 13.6	-0.99 ± 4.7	0.997	3.9 ± 2.8	0.500	5.1 ± 3.4	0.432	10.0 ± 4.3	0.099
Countermovement Jump (cm)	53.7 ± 7.4	50.8 ± 8.9	52.2 ± 7.5	51.4 ± 8.1	3.0 ± 3.1	0.798	0.82 ± 1.9	0.971	1.5 ± 2.1	0.883	-0.58 ± 3.1	0.998
Grip Strength DH (kg)	50.8 ± 8.8	46.9 ± 6.4	46.6 ± 6.5	46.1 ± 5.9	3.9 ± 2.9	0.537	0.48 ± 1.7	0.996	4.2 ± 1.9	0.104	0.81 ± 2.8	0.975
Grip Strength NDH (kg)	47.5 ± 7.5	47.1 ± 6.0	43.2 ± 6.6	42.6 ± 5.4	0.33 ± 2.6	0.999	0.56 ± 1.6	0.990	4.2 ± 1.7	0.075	4.5 ± 2.5	0.316
10m Sprint (s)	1.79 ± 0.09	1.77 ± 0.10	1.77 ± 0.09	1.78 ± 0.10	0.02 ± 0.04	0.922	-0.00 ± 0.02	1.000	0.01 ± 0.03	0.966	-0.01 ± 0.04	0.991
40m Sprint (s)	5.52 ± 0.28	5.46 ± 0.36	5.49 ± 0.32	5.54 ± 0.35	0.06 ± 0.13	0.961	-0.05 ± 0.08	0.929	0.03 ± 0.09	0.992	-0.09 ± 0.12	0.899
Momentum (m/s. kg)	637 ± 53.5	621 ± 70.3	595 ± 63.3	579 ± 101.8	16.6 ± 30.5	0.948	16.1 ± 18.2	0.810	42.3 ± 20.6	0.177	41.8 ± .28.9	0.474
Agility DL (s)	8.37 ± 0.48	8.09 ± 0.44	8.40 ± 0.43	8.40 ± 0.33	0.28 ± 0.25	0.662	-0.00 ± 0.13	1.000	-0.02 ± 0.16	1.000	-0.30 ± 0.23	0.560
Agility NDL (s)	8.51 ± 0.45	8.24 ± 0.35	8.60 ± 0.42	8.50 ± 0.31	0.27 ± 0.23	0.549	0.11 ± 0.13	0.828	-0.09 ± 0.15	0.918	-0.26 ± 0.22	0.644
Power (w)	6244 ± 525.3	6081 ± 688.0	5831 ± 619.6	5673 ± 997.5	162.7 ± 290.8	0.948	158.0 ± 177.9	0.811	413.0 ± 202.1	0.179	408.3 ± 293.0	0.476
Peak Anaerobic Power (w)	7246 ± 398.7	6974 ± 425.8	4841 ± 417.8	4700 ± 662.3	281.9 ± 203.2	0.510	140.5 ± 117.4	0.630	2405.2 ± 136.9	**0.000****	2263.8 ± 190.6	**0.000****

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 8: Birthdate distribution effect on anthropometrics and physical performance differences (Mean ± Standard Deviation) in Forwards Age Grade Rugby Union

Under 16s Forwards	**Regional H1**	**Regional H2**	**Club H1**	**Club H2**	**Regional (H1 vs H2)**	***P***	**Club (H1 vs H2)**	***P***	**Regional Vs Club (H1 vs H1)**	***P***	**Regional Vs Club (H2 vs H2)**	***P***
Height (cm)	178.8 ± 6.3	179.9 ± 5.1	176.0 ± 5.1	174.9 ± 6.1	1.1 ± 1.8	0.932	1.1 ± 2.0	0.941	2.8 ± 1.7	0.372	5.0 ± 2.0	0.078
Weight (kg)	82.0 ± 13.4	84.6 ± 17.3	75.8 ± 16.9	73.0 ± 13.1	-2.6 ± 4.7	0.944	2.8 ± 5.1	0.946	6.2 ± 4.5	0.518	11.6 ± 5.3	0.138
Countermovement Jump (cm)	46.6 ± 6.1	44.2 ± 6.8	45.4 ± 7.5	44.3 ± 5.4	2.4 ± 2.1	0.645	1.1 ± 2.3	0.966	1.2 ± 2.0	0.930	-0.15 ± 2.3	1.000
Grip Strength DH (kg)	40.6 ± 5.4	42.2 ± 4.8	41.6 ± 6.4	38.7 ± 6.3	-1.5 ± 1.8	0.833	2.9 ± 2.0	0.459	-1.0 ± 1.7	0.945	3.5 ± 2.0	0.332
Grip Strength NDH (kg)	36.8 ± 5.9	38.5 ± 4.5	39.5 ± 6.5	35.4 ± 7.6	-1.7 ± 2.0	0.819	4.1 ± 2.1	0.222	-2.7 ± 1.9	0.476	3.1 ± 2.2	0.495
10m Sprint (s)	1.85 ± 0.16	1.83 ± 0.08	1.84 ± 0.11	1.88 ± 0.10	0.02 ± 0.04	0.954	-0.04 ± 0.04	0.848	0.01 ± 0.04	0.994	-0.05 ± 0.04	0.728
40m Sprint (s)	5.76 ± 0.31	5.79 ± 0.36	5.92 ± 0.43	5.90 ± 0.40	-0.03 ± 0.12	0.993	0.02 ± 0.13	0.999	-0.16 ± 0.11	0.469	-0.11 ± 0.13	0.841
Momentum (m/s. kg)	572 ± 70.4	586 ± 118.6	511.2 ± 95.6	497 ± 67.0	-13.3 ± 27.8	0.964	14.6 ± 30.4	0.964	61.2 ± 26.4	0.103	89.0 ± 31.7	**0.032****
Agility DL (s)	8.64 ± 0.32	8.68 ± 0.36	9.02 ± 0.48	8.47 ± 0.55	-0.05 ± 0.18	0.994	0.55 ± 0.26	0.176	-0.38 ± 0.16	0.108	0.21 ± 0.27	0.859
Agility NDL (s)	8.77 ± 0.35	8.91 ± 0.43	9.17 ± 0.48	8.82 ± 0.44	-0.14 ± 0.19	0.875	0.34 ± 0.27	0.595	-0.39 ± 0.17	0.111	0.09 ± 0.28	0.989
Power (w)	5609 ± 689.6	5750 ± 1161.6	5009 ± 936.0	4866 ± 657.2	-130.1 ± 272.4	0.964	142.7 ± 298.2	0.964	600.2 ± 258.5	0.103	873.0 ± 310.3	**0.031****
Peak Anaerobic Power (w)	4504 ± 559.5	4459 ± 692.6	4142 ± 794.4	3874 ± 374.3	45.4 ± 196.8	0.996	267.7 ± 218.1	0.612	362.7 ± 189.8	0.233	585.1 ± 224.2	0.053
Under 18s Forwards	**Regional H1**	**Regional H2**	**Club H1**	**Club H2**	**Regional (H1 vs H2)**	***P***	**Club (H1 vs H2)**	***P***	**Regional Vs Club (H1 vs H1)**	***P***	**Regional Vs Club (H2 vs H2)**	***P***
Height (cm)	181.3 ± 6.3	182.0 ± 5.8	181.7 ± 6.6	NO DATA	-0.71 ± 2.6	0.959	NO DATA		-0.26 ± 2.4	0.988	NO DATA	
Weight (kg	88.8 ± 10.6	97.0 ± 19.4	84.9 ± 11.3		-8.2 ± 5.6	0.316			3.8 ± 5.3	0.754		
Countermovement Jump (cm)	49.5 ± 7.3	47.8 ± 6.2	47.6 ± 8.7		1.7 ± 3.2	0.854			1.9 ± 3.0	0.811		
Grip Strength DH (kg)	46.9 ± 7.2	48.6 ± 7.9	44.0 ± 4.6		-1.7 ± 2.9	0.828			2.9 ± 2.7	0.530		
Grip Strength NDH (kg)	44.0 ± 8.0	44.4 ± 7.4	40.1 ± 3.4		-0.41 ± 2.8	0.988			3.9 ± 2.7	0.315		
10m Sprint (s)	1.81 ± 0.08	1.82 ± 0.08	1.85 ± 0.12		-0.01 ± 0.04	0.944			-0.04 ± 0.04	0.563		
40m Sprint (s)	5.61 ± 0.24	5.70 ± 0.29	5.83 ± 0.48		-0.09 ± 0.15	0.797			-0.22 ± 0.14	0.281		
Momentum (m/s. kg)	627 ± 63.8	680 ± 117.4	592 ± 66.5		-53.0 ± 35.1	0.425			34.6 ± 34.1	0.951		
Agility DL (s)	8.39 ± 0.32	8.84 ± 0.48	8.90 ± 0.57		-0.45 ± 0.32	0.369			-0.51 ± 0.23	0.101		
Agility NDL (s)	8.58 ± 0.33	8.90 ± 0.47	9.03 ± 0.56		-0.32 ± 0.33	0.602			-0.45 ± 0.23	0.162		
Power (w)	6142 ± 623.1	6660 ± 1152.3	5801 ± 650.4		-517.8 ± 344.3	0.303			340.8 ± 333.6	0.569		
Peak Anaerobic Power (w)	4931 ± 298.3	5252 ± 853.1	4709 ± 481.4		-321.1 ± 234.0	0.367			222.6 ± 220.6	0.577		
Elite Under 18s Forwards	**Elite H1**	**Elite H2**	**Under 18s H1**	**Under 18s H2**	**Elite (H1 vs H2)**	***P***	**Under 18s (H1 vs H2)**	***P***	**Elite Vs Under 18s (H1 vs H1)**	***P***	**Elite Vs Under 18s (H2 vs H2)**	***P***
Height (cm)	182.0 ± 6.6	178.6 ± 11.4	181.6 ± 6.1	181.7 ± 6.0	3.4 ± 4.1	0.844	-0.14 ± 2.3	1.000	0.37 ± 2.1	0.998	-3.1 ± 4.2	0.877
Weight (kg)	90.6 ± 8.7	99.7 ± 19.2	86.6 ± 10.7	93.9 ± 19.4	-9.0 ± 8.1	0.684	-7.3 ± 4.5	0.365	4.1 ± 4.1	0.749	5.8 ± 8.3	0.900
Countermovement Jump (cm)	53.1 ± 7.5	42.5 ± 7.8	50.1 ± 7.3	49.0 ± 10.3	10.6 ± 5.0	0.167	1.0 ± 2.9	0.984	3.0 ± 2.6	0.641	-6.5 ± 5.2	0.600
Grip Strength DH (kg)	52.8 ± 8.6	43.3 ± 1.3	46.5 ± 6.9	49.2 ± 7.9	9.5 ± 4.7	0.199	-2.7 ± 2.8	0.780	6.3 ± 2.4	0.056	-5.9 ± 4.9	0.638
Grip Strength NDH (kg)	48.8 ± 7.7	41.5 ± 0.87	43.1 ± 7.1	45.6 ± 8.0	7.3 ± 4.6	0.403	-2.4 ± 2.7	0.808	5.6 ± 2.3	0.086	-4.1 ± 4.8	0.835
10m Sprint (s)	1.81 ± 0.08	1.87 ± 0.09	1.81 ± 0.09	1.83 ± 0.10	-0.07 ± 0.06	0.671	-0.02 ± 0.04	0.942	-0.00 ± 0.03	0.999	0.04 ± 0.06	0.902
40m Sprint (s)	5.60 ± 0.25	5.88 ± 0.28	5.64 ± 0.32	5.79 ± 0.41	-0.28 ± 0.20	0.504	-0.15 ± 0.12	0.627	-0.04 ± 0.10	0.982	0.09 ± 0.21	0.971
Momentum (m/s. kg)	647 ± 48.0	676 ± 97.2	612 ± 64.8	675 ± 120.0	-29.0 ± 46.6	0.924	-62.4 ± 28.0	0.147	34.5 ± 23.7	0.473	1.1 ± 49.4	1.000
Agility DL (s)	8.50 ± 0.48		8.56 ± 0.47	8.61 ± 0.52			-0.05 ± 0.30	0.984	-0.06 ± 0.22	0.966		
Agility NDL (s)	8.62 ± 0.46		8.73 ± 0.46	8.65 ± 0.54			0.07 ± 0.30	0.968	-0.11 ± 0.21	0.866		
Power (w)	6337 ± 470.9	6620 ± 954.8	5999 ± 633.7	6611 ± 1176.7	-282.2 ± 457.1	0.926	611.8 ± 282.4	0.147	338.6 ± 232.6	0.472	9.0 ± 484.3	1.000
Peak Anaerobic Power (w)	7329 ± 419.7	7097 ± 691.5	4895 ± 376.4	5175 ± 869.9	232.6 ± 336.2	0.900	-279.2 ± 193.4	0.478	2433.9 ± 171.1	**0.000 ****	1922.0 ± 348.1	**0.000****

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 9: Birthdate distribution effect on anthropometrics and physical performance differences (Mean ± Standard Deviation) in Backs Age Grade Rugby Union

Under 16s Backs	**Regional H1**	**Regional H2**	**Club H1**	**Club H2**	**Regional (H1 vs H2)**	***P***	**Club (H1 vs H2)**	***P***	**Regional Vs Club (H1 vs H1)**	***P***	**Regional Vs Club (H2 vs H2)**	***P***
Height (cm)	173.4 ± 6.7	174.6 ± 5.3	172.9 ± 7.9	170.9 ± 8.2	-1.2 ± 2.4	0.956	0.45 ± 2.5	0.871	1.7 ± 2.8	0.998	3.7 ± 2.5	0.475
Weight (kg)	67.4 ± 8.6	67.7 ± 9.3	70.0 ± 8.0	62.4 ± 9.7	-0.27 ± 3.1	1.000	7.6 ± 3.3	0.104	-2.5 ± 3.1	0.848	5.3 ± 3.2	0.355
Countermovement Jump (cm)	50.1 ± 1.4	50.0 ± 1.7	49.0 ± 1.8	46.6 ± 1.6	0.05 ± 2.2	1.000	2.4 ± 2.4	0.740	1.1 ± 2.3	0.965	3.4 ± 2.3	0.458
Grip Strength DH (kg)	42.7 ± 5.7	37.0 ± 8.3	38.0 ± 6.8	35.9 ± 7.2	5.7 ± 2.5	0.108	2.1 ± 2.8	0.879	4.8 ± 2.7	0.298	1.1 ± 2.6	0.972
Grip Strength NDH (kg)	39.9 ± 6.1	34.4 ± 9.4	35.3 ± 5.1	33.5 ± 7.7	5.5 ± 2.6	0.151	1.8 ± 2.9	0.928	4.6 ± 2.8	0.360	0.88 ± 2.7	0.988
10m Sprint (s)	1.76 ± 0.08	1.78 ± 0.10	1.79 ± 0.07	1.84 ± 0.09	-0.02 ± 0.03	0.857	-0.05 ± 0.03	0.436	-0.04 ± 0.03	0.658	-0.06 ± 0.03	0.181
40m Sprint (s)	5.47 ± 0.29	5.47 ± 0.31	5.66 ± 0.35	5.77 ± 0.33	0.00 ± 0.11	1.000	-0.12 ± 0.12	0.778	-0.18 ± 0.12	0.396	-0.30 ± 0.12	0.054
Momentum (m/s. kg)	515 ± 70.7	458 ± 84.4	482 ± 48.7	438 ± 82.1	57.5 ± 26.4	0.143	44.3 ± 29.9	0.457	33.0 ± 28.7	0.662	19.8 ± 27.7	0.891
Agility DL (s)	8.28 ± 0.33	8.38 ± 0.30	8.60 ± 0.19	8.54 ± 0.28	-0.10 ± 0.15	0.916	0.06 ± 0.16	0.975	-0.32 ± 0.16	0.194	-0.16 ± 0.15	0.712
Agility NDL (s)	8.42 ± 0.36	8.46 ± 0.28	8.80 ± 0.21	8.73 ± 0.44	-0.05 ± 0.18	0.992	0.08 ± 0.19	0.974	-0.39 ± 0.19	0.183	-0.26 ± 0.18	0.473
Power (w)	4859 ± 771.3	4822 ± 794.4	4827 ± 555.3	4250 ± 798.1	36.4 ± 263.0	0.999	577.2 ± 290.9	0.206	31.6 ± 277.5	0.999	572.3 ± 277.0	0.176
Peak Anaerobic Power (w)	3899 ± 970.2	4041 ± 603.1	4087 ± 516.4	3620 ± 610.9	-141.9 ± 258.5	0.946	467.7 ± 272.2	0.323	-188.2 ± 258.5	0.885	421.4 ± 272.2	0.416
Under 18s Backs	**Regional H1**	**Regional H2**	**Club H1**	**Club H2**	**Regional (H1 vs H2)**	***P***	**Club (H1 vs H2)**	***P***	**Regional Vs Club (H1 vs H1)**	***P***	**Regional Vs Club (H2 vs H2)**	***P***
Height (cm)	178.4 ± 4.5	177.8 ±5.0	177.4 ± 7.1	174.2 ± 6.0	.62 ± 2.3	0.993	3.2 ± 2.5	0.581	1.1 ± 2.6	0.976	3.6 ± 2.5	0.370
Weight (kg)	77.6 ± 6.6	76.3 ± 5.7	72.4 ± 8.5	70.7 ± 6.3	1.2 ± 2.8	0.968	1.7 ± 2.9	0.935	5.1 ± 3.1	0.350	5.6 ± 2.6	0.159
Countermovement Jump (cm)	57.4 ± 7.2	52.9 ± 8.1	55.3 ± 3.9	56.2 ± 5.7	4.6 ± 2.9	0.404	-0.94 ± 3.0	0.990	2.2 ± 3.2	0.907	-3.3 ± 2.7	0.603
Grip Strength DH (kg)	47.9 ± 7.0	45.6 ± 4.7	46.4 ± 5.5	46.8 ± 6.6	2.3 ± 2.5	0.792	-0.36 ± 2.6	0.999	1.6 ± 2.8	0.944	-1.1 ± 2.3	0.961
Grip Strength NDH (kg)	44.3 ± 7.6	43.4 ± 3.2	42.1 ± 6.2	43.1 ± 5.5	0.96 ± 2.4	0.977	-1.1 ± 2.5	0.972	2.3 ± 2.6	0.809	0.30 ± 2.2	0.999
10m Sprint (s)	1.75 ± 0.06	1.75 ± 0.10	1.74 ± 0.09	1.74 ± 0.07	0.01 ± 0.04	0.985	-0.00 ± 0.04	1.000	0.01 ± 0.04	0.990	-0.01 ± 0.04	0.999
40m Sprint (s)	5.34 ± 0.08	5.42 ± 0.25	5.35 ± 0.31	5.31 ± 0.23	-0.08 ± 0.11	0.870	0.04 ± 0.11	0.987	-0.01 ± 0.12	1.000	0.10 ± 0.10	0.715
Momentum (m/s. kg)	581 ± 51.6	565 ± 52.3	529 ± 65.8	528 ± 57.7	15.6 ± 25.4	0.927	0.48 ± 26.8	1.000	51.9 ± 28.2	0.274	36.8 ± 23.8	0.421
Agility DL (s)	8.17 ± 0.29	8.26 ± 0.22	8.14 ± 0.17	8.44 ± 0.33	-0.09 ± 0.16	0.940	-0.31 ± 0.15	0.203	0.03 ± 0.17	0.997	-0.18 ± 0.14	0.602
Agility NDL (s)	8.30 ± 0.30	8.39 ± 0.23	8.51 ± 0.30	8.55 ± 0.28	-0.09 ± 0.17	0.952	-0.03 ± 0.16	0.995	-0.21 ± 0.18	0.632	-0.16 ± 0.15	0.719
Power (w)	5692 ± 507.6	5541 ± 512.9	5185 ± 646.5	5178 ± 564.5	151.6 ± 249.0	0.929	6.1 ± 262.8	1.000	507.8 ± 277.0	0.276	362.2 ± 233.1	0.417
Peak Anaerobic Power (w)	4919 ± 560.0	4616 ± 444.6	4489 ± 373.5	4559 ± 517.3	303.8 ± 208.7	0.473	-70.1 ± 219.7	0.989	430.8 ± 233.8	0.270	56.9 ± 192.7	0.991
Elite Under 18s backs	**Elite H1**	**Elite H2**	**Under 18s H1**	**Under 18s H2**	**Elite (H1 vs H2)**	***P***	**Under 18s (H1 vs H2)**	***P***	**Elite Vs Under 18s (H1 vs H1)**	***P***	**Elite Vs Under 18s (H2 vs H2)**	***P***
Height (cm)	181.9 ± 2.6	178.8 ± 4.7	176.7 ± 5.9	176.7 ± 5.6	3.1 ± 3.1	0.749	0.06 ± 1.7	1.000	5.2 ± 2.6	.186	2.2 ± 2.4	0.811
Weight (kg)	81.3 ± 8.0	77.7 ± 5.8	75.6 ± 7.4	73.7 ± 7.7	3.5 ± 4.3	0.847	1.9 ± 2.3	0.840	5.6 ± 3.5	.394	4.1 ± 3.4	0.631
Countermovement Jump (cm)	55.7 ± 7.5	55.6 ± 5.7	55.7 ± 5.3	53.6 ± 7.3	0.05 ± 4.0	1.000	2.0 ± 2.2	0.789	0.02 ± 3.4	1.000	2.0 ± 3.0	0.912
Grip Strength DH (kg)	44.5 ± 6.7	49.4 ± 7.1	46.4 ± 5.4	45.5 ± 5.1	-4.9 ± 3.4	0.469	0.93 ± 1.7	0.950	-1.9 ± 2.8	0.906	3.9 ± 2.5	0.409
Grip Strength NDH (kg)	43.3 ± 5.9	50.5 ± 5.0	42.8 ± 4.7	42.3 ± 4.7	-7.2 ± 3.1	0.903	0.50 ± 1.5	0.988	0.48 ± 2.5	0.997	8.2 ± 2.3	**0.006****
10m Sprint (s)	1.73 ± 0.08	1.71 ± 0.04	1.73 ± 0.06	1.75 ± 0.09	0.02 ± 0.05	0.100	-0.03 ± 0.02	0.697	0.01 ± 0.04	0.999	-0.04 ± 0.03	0.641
40m Sprint (s)	5.25 ± 0.22	5.24 ± 0.14	5.25 ± 0.11	5.44 ± 0.27	0.01 ± 0.31	0.978	-0.19 ± 0.07	0.051	0.00 ± 0.11	1.000	-0.20 ± 0.10	0.198
Momentum (m/s. kg)	607 ± 64.5	593 ± 37.3	566 ± 49.3	542 ± 65.2	14.0 ± 35.1	0.978	23.6 ±19.2	0.612	41.5 ± 29.9	0.513	51.2 ± 26.6	0.232
Agility DL (s)	8.07 ± 0.36	7.89 ± 0.22	8.15 ± 0.21	8.35 ± 0.28	0.18 ± 0.21	0.826	-0.19 ± 0.11	0.311	-0.08 ± 0.17	0.968	-0.46 ± 0.17	0.053
Agility NDL (s)	8.26 ± 0.36	8.07 ± 0.16	8.42 ± 0.30	8.46 ± 0.25	0.19 ± 0.23	0.833	-0.04 ± 0.12	0.989	-0.16 ± 0.18	0.812	-0.39 ± 0.18	0.152
Power (w)	5944 ± 633.5	5812 ± 362.7	5543 ± 484.6	5311 ± 638.9	132.6 ± 344.1	0.980	231.2 ± 188.6	0.614	401.9 ± 293.4	0.524	500.6 ± 260.5	0.234
Peak Anaerobic Power (w)	6980 ± 134.3	6898 ± 288.1	4687 ± 395.9	4535 ± 476.0	81.8 ± 251.7	0.988	151.7 ± 135.7.	0.681	2292.9 ± 203.6	**0.000****	2362.7 ± 188.9	**0.000****

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 10: Birthdate distribution effect on psychological differences (Mean ± Standard Deviation) in Under 16s Rugby Union

Under 16s	Regional H1	Regional H2	Club H1	Club H2	Regional (H1 vs H2)	*P*	Club (H1 vs H2)	*P*	Regional Vs Club (H1 vs H1)	*P*	Regional Vs Club (H2 vs H2)	*P*
Outcome Focus	8.4 ± 1.6	8.6 ± 1.4	8.2 ± 1.4	8.6 ± 1.1	-0.24 ± 0.33	0.882	-0.46 ± 0.36	0.569	0.22 ± 0.32	0.895	0.00 ± 0.35	1.000
Mastery Focus	9.1 ± 1.4	9.3 ± 0.84	9.1 ± 1.4	9.2 ± 0.94	-0.14 ± 0.28	0.963	-0.11 ± 0.30	0.981	0.08 ± 0.27	0.992	0.10 ± 0.30	0.988
Commitment	8.4 ± 0.95	8.6 ± 1.1	8.3 ± 1.2	8.2 ± 1.2	-0.15 ± 0.25	0.938	0.05 ± 0.27	0.998	0.16 ± 0.24	0.915	0.35 ± 0.27	0.572
Athlete Burnout	28.7 ± 5.1	27.2 ± 5.3	30.1 ± 7.5	29.7 ± 6.3	1.5 ± 1.4	0.721	0.44 ± 1.5	0.991	-1.4 ± 1.4	0.720	-2.9 ± 1.5	0.238
Exhaustion	8.8 ± 2.7	8.9 ± 2.4	9.4 ± 3.1	10.1 ± 3.4	-0.05 ± 0.67	1.000	-0.72 ± 0.73	0.757	-0.59 ± 0.66	0.811	-1.3 ± 0.74	0.328
RS. Accomplishment	12.0 ± 3.0	11.2 ± 2.9	12.6 ± 3.2	11.9 ± 2.9	0.82 ± 0.70	0.644	0.66 ± 0.76	0.821	-0.57 ± 0.68	0.836	-0.74 ± 0.77	0.772
Sport Devaluation	7.8 ± 2.5	7.1 ± 2.1	8.1 ± 2.7	7.6 ± 2.3	0.69 ± 0.56	0.606	0.50 ± 0.60	0.840	-0.27 ± 0.55	0.958	-0.46 ± 0.61	0.875
Life Stress	6.5 ± 2.7	6.2 ± 2.3	6.8 ± 2.2	7.2 ± 2.7	0.3 ± 0.6	0.969	-0.4 ± 0.6	0.938	-0.3 ± 0.6	0.944	1.0 ± 0.6	0.438
Training stress	6.3 ± 2.4	6.2 ± 1.9	6.6 ± 2.7	7.0 ± 2.6	0.1 ± 0.6	0.998	-0.4 ± 0.6	0.919	-0.3 ± 0.5	0.930	-0.8 ± 0.6	0.524
Athlete Identity	7.0 ± 1.6	7.0 ± 1.9	6.8 ± 1.5	6.6 ± 1.7	-0.05 ± 0.28	0.999	0.13 ± 0.41	0.988	0.23 ± 0.37	0.927	0.42 ± 0.41	0.747
Optimism	14.7 ± 2.0	14.4 ± 2.5	14.2 ± 2.5	13.9 ± 2.2	0.29 ± 0.52	0.946	0.27 ± 0.57	0.962	0.56 ± 0.51	0.684	0.55 ± 0.56	0.761
Alexithymia	15.2 ± 3.0	14.1 ± 2.8	15.3 ± 3.0	15.4 ± 3.1	1.2 ± 0.7	0.339	0.1 ± 0.7	0.999	0.0 ± 0.7	1.000	-1.3 ± 0.7	0.309
Difficulty Identifying Feelings	5.0 ± 1.6	4.1 ± 1.8	4.7 ± 1.7	4.7 ± 1.7	0.9 ± 0.4	0.096	0.0 ± 0.4	1.000	0.3 ± 0.4	0.848	-0.6 ± 0.4	0.513
Difficulty Describing Feelings	4.8 ± 1.8	4.2 ± 1.8	4.5 ± 1.7	4.9 ± 1.8	0.9 ± 0.4	0.488	-0.4 ± 0.4	0.853	0.3 ± 0.4	0.905	-0.7 ± 0.4	0.447
Externally Orientated Feelings	5.5 ± 1.4	5.7 ± 1.4	6.1 ± 1.8	5.7 ± 1.6	-0.2 ± 0.4	0.936	-0.4 ± 0.4	0.783	-0.6 ± 0.4	0.290	-0.1 ± 0.4	0.999
Perfectionistic Concerns	14.0 ± 3.7	12.6 ± 2.6	12.8 ± 3.2	13.5 ± 3.2	1.5 ± 0.75	0.219	0.66 ± 0.80	0.845	1.2 ± 0.74	0.361	-0.90 ± 0.82	0.685
Perfectionistic Striving	7.4 ± 1.1	6.8 ± 1.4	6.8 ± 1.3	6.6 ± 1.4	0.65 ± 0.30	0.128	0.22 ± 0.32	0.894	0.61 ± 0.29	0.162	0.18 ± 0.32	0.945
Self-Esteem	14.5 ± 2.3	12.7 ± 3.0	13.3 ± 1.5	14.2 ± 2.2	1.8 ± 0.53	**0.005****	0.95 ± 0.57	0.340	1.2 ± 0.52	0.114	-1.6 ± 0.58	**0.037****
Extraversion	8.8 ± 2.2	9.4 ± 2.1	9.3 ± 1.8	9.8 ± 1.9	-0.57 ± 0.47	0.627	-0.47 ± 0.51	0.797	-0.52 ± 0.47	0.684	-0.41 ± 0.52	0.856
Agreeableness	9.1 ± 1.9	9.6 ± 1.9	9.3 ± 1.9	8.3 ± 1.9	-0.53 ± 0.44	0.609	1.0 ± 0.47	0.133	-0.22 ± 0.43	0.956	1.4 ± 0.48	**0.029****
Conscientiousness	8.8 ± 2.6	10.5 ± 2.3	9.3 ± 2.4	9.8 ± 2.1	-1.7 ± 0.57	**0.012****	-0.41 ± 0.60	0.905	-0.63 ± 0.54	0.654	0.69 ± 0.61	0.673
Emotional Stability	9.3 ± 2.5	9.7 ± 2.6	9.4 ± 2.6	9.6 ± 2.3	-0.34 ± 0.57	0.934	-0.19 ± 0.62	0.990	-0.11 ± 0.56	0.997	0.04 ± 0.63	1.000
Openness	9.3 ± 2.3	9.6 ± 2.1	9.8 ± 2.4	10.4 ± 2.2	-0.28 ± 0.52	0.948	-0.63 ± 0.56	0.678	-0.50 ± 0.51	0.763	-0.84 ± 0.57	0.452
Amotivation	3.1 ± 1.4	3.1 ± 1.7	4.1 ± 2.6	3.9 ± 2.1	-0.04 ± 0.65	1.000	0.19 ± 0.70	1.000	-0.98 ± 0.66	1.000	-0.75 ± 0.68	1.000
External Regulation	3.1 ± 1.5	3.1 ± 1.6	2.9 ± 1.3	3.4 ± 2.2	-0.04 ± 0.56	1.000	-0.48 ± 0.61	1.000	0.16 ± 0.57	1.000	-0.28 ± 0.60	1.000
Introjected Regulation	3.8 ± 1.8	3.3 ± 1.9	3.4 ± 2.6	5.3 ± 2.9	0.55 ± 0.77	1.000	-1.9 ± 0.83	0.139	0.46 ± 0.79	1.000	-2.0 ± 0.82	0.095
Identified Regulation	11.9 ± 1.6	9.9 ± 3.1	10.9 ± 2.7	10.8 ± 1.8	2.9 ± 0.77	0.085	0.09 ± 0.83	1.000	1.0 ± 0.78	1.000	-0.83 ± 0.81	1.000
Integrated Regulation	11.7 ± 1.9	10.1 ± 2.6	10.6 ± 1.8	10.8 ± 2.7	1.7 ± 0.76	0.195	-0.12 ± 0.82	1.000	1.1 ± 0.78	1.000	-0.70 ± 0.80	1.000
IM-General	12.9 ± 1.4	12.3 ±2.5	13.0 ± 2.9	11.6 ± 3.2	0.58 ± 0.84	1.000	1.4 ± .090	0.835	-0.09 ± 0.86	1.000	0.69 ± 0.89	1.000
Resilience	22.5 ± 2.9	23.0 ± 3.2	23.1 ± 3.5	21.8 ± 3.2	-0.55 ± 1.1	1.000	1.3 ± 1.1	1.000	-0.62 ± 1.1	1.000	1.2 ± 1.1	1.000
Emotional Intelligence	45.7 ± 4.5	44.9 ± 5.4	46.9 ± 4.1	44.7 ± 4.2	0.9 ± 1.4	0.937	2.2 ± 1.5	0.457	-1.1 ± 1.5	0.865	0.2 ± 1.5	0.999
Appraisal of Own Emotions	7.6 ±1.3	6.6 ±2.2	7.5 ± 0.9	7.1 ± 2.0	1.0 ± 0.5	0.233	0.4 ± 0.6	0.891	0.1 ± 0.6	0.999	-0.6 ± 0.6	0.734
Appraisal of Others Emotions	7.6 ± 1.4	7.5 ± 1.1	8.2 ± 1.1	7.1 ± 1.3	0.1 ± 0.4	0.999	1.1 ± 0.4	**0.043****	-0.6 ± 0.4	0.400	0.4 ± 0.4	0.739
Regulation of Own Emotions	8.1 ± 1.2	8.1 ± 1.4	8.7 ±1.3	7.9 ± 1.3	0.1 ± 0.4	0.999	0.9 ± 0.4	0.203	-0.6 ± 0.4	0.484	0.2 ± 0.4	0.969
Regulation of Others Emotions	7.0 ± 1.2	6.9 ±2.0	7.1 ± 1.3	7.1 ± 0.9	0.1 ± 0.4	0.999	0.1 ± 0.4	1.000	-0.1 ± 0.4	0.990	-0.3 ± 0.4	0.986
Utilisation of Emotions Coping	8.2 ± 1.1	8.2 ± 1.0	7.9 ± 1.0	8.2 ± 1.0	-0.0 ± 0.3	1.000	-0.3 ± 0.3	0.842	0.2 ± 0.3	0.908	-0.0 ± 0.3	1.000
Strategies	28.2 ± 5.1	28.8 ± 5.9	26.9 ± 5.3	26.1 ± 5.1	-0.62 ± 1.8	1.000	0.87 ± 1.9	1.000	1.3 ± 1.8	1.000	2.7 ± 1.9	0.900
Coping with Adversity	4.1 ± 1.2	4.2 ± 1.3	3.9 ± 1.3	3.5 ± 1.5	-0.11 ± 0.44	1.000	0.46 ± 0.47	1.000	0.16 ± 0.45	1.000	0.73 ± 0.46	0.721
Performing Under Pressure	4.0 ± 1.4	3.8 ± 1.0	4.0 ± 1.4	3.6 ± 1.2	0.25 ± 0.42	1.000	0.35 ± 0.45	1.000	0.05 ± 0.43	1.000	0.15 ± 0.45	1.000
Mental Preparation	3.9 ± 1.3	3.0 ± 1.1	3.1 ± 1.4	3.3 ± 1.4	0.86 ± 0.44	0.328	-0.22 ± 0.48	1.000	0.79 ± 0.45	0.500	-0.29 ± 0.47	1.000
Concentration	4.4 ± 0.91	4.5 ± 1.4	4.3 ± 1.1	4.2 ± 1.3	-0.12 ± 0.38	1.000	0.11 ± 0.41	1.000	0.12 ± 0.39	1.000	0.36 ± 0.41	1.000
Free from Worry	2.8 ± 1.1	3.9 ± 1.6	3.4 ± 1.5	3.2 ± 1.2	-1.1 ± .45	0.102	0.63 ± 0.47	1.000	-0.58 ± 0.46	1.000	0.63 ± 0.47	1.000
Achievement Motivation	4.0 ± 1.1	4.3 ± 1.2	3.4 ± 1.0	3.6 ± 1.2	-0.38 ± 0.38	1.000	0.69 ± 0.40	1.000	0.60 ± 0.39	0.757	0.69 ± 0.40	0.544
Coachability	5.0 ± 1.2	5.1 ± 1.1	4.9 ± 0.92	4.6 ± 1.3	-0.02 ± 0.39	1.000	0.48 ± 0.41	1.000	0.12 ± 0.39	1.000	0.48 ± 0.41	1.000

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 11: Birthdate distribution effect on psychological differences (Mean ± Standard Deviation) in Under 18s Rugby Union

Under 18s	Regional H1	Regional H2	Club H1	Club H2	Regional (H1 vs H2)	*P*	Club (H1 vs H2)	*P*	Regional Vs Club (H1 vs H1)	*P*	Regional Vs Club (H2 vs H2)	*P*
Outcome Focus	8.4 ± 1.4	8.7 ± 1.2	9.1 ± 1.1	7.5 ± 1.9	-0.29 ± 0.40	0.882	1.6 ± 0.49	**0.009****	-0.63 ± 0.42	0.428	1.2 ± 0.47	**0.048****
Mastery Focus	8.8 ± 1.2	9.3 ± 0.94	9.4 ± 0.81	8.1 ± 1.4	-0.42 ± 0.32	0.559	1.3 ± 0.39	**0.009****	-0.52 ± 0.33	0.413	1.3 ± 0.39	**0.009****
Commitment	7.8 ± 1.3	7.7 ± 1.3	7.8 ± 1.0	7.8 ± 1.1	0.17 ± 0.45	0.964	0.03 ± 0.43	1.000	0.03 ± 0.37	1.000	-0.10 ± 0.42	0.995
Athlete Burnout	29.9 ± 7.0	30.9 ± 5.9	31.3 ± 7.3	35.6 ± 7.3	-1.0 ± 2.2	0.970	-4.4 ± 2.3	0.230	-1.4 ± 2.2	0.915	-4.8 ± 2.3	0.187
Exhaustion	9.3 ± 2.9	10.4 ± 2.8	9.8 ± 3.0	11.9 ± 3.7	0.52 ± 0.92	0.942	-2.1 ± 1.0	0.178	-0.49 ± 0.99	0.959	-1.5 ± 1.1	0.485
RS. Accomplishment	12.2 ± 2.7	12.9 ± 2.6	13.9 ± 1.9	12.0 ± 2.6	-0.71 ± 0.77	0.793	1.9 ± 0.95	0.196	-0.17 ± 0.81	0.163	0.92 ± 0.92	0.750
Sport Devaluation	8.6 ± 2.7	7.5 ± 2.2	8.6 ± 2.4	10.6 ± 3.6	1.0 ± 0.77	0.528	-2.1 ± 0.95	0.136	0.03 ± 0.80	1.000	-3.1 ± 0.91	**0.006****
Life Stress	7.2 ± 2.0	7.4 ± 2.3	7.2 ± 1.8	7.4 ± 2.6	-0.2 ± 0.7	0.998	-0.2 ± 0.8	0.997	-0.0 ± 0.7	1.000	0.0 ± 0.7	1.000
Training stress	7.3 ± 2.1	7.0 ± 2.5	7.0 ± 2.2	6.7 ±2.5	0.2 ± 0.7	0.974	0.3 ± 0.8	0.984	0.3 ± 0.7	0.981	0.3 ± 0.8	0.979
Athlete Identity	6.1 ± 1.9	6.1 ± 1.9	6.7 ± 1.9	6.7 ± 1.7	0.04 ± 0.55	1.000	0.01 ± 0.66	1.000	-0.57 ± 0.57	0.749	-0.61 ± 0.65	0.784
Optimism	14.2 ± 1.8	13.7 ± 2.6	14.1 ± 2.6	13.7 ±2.9	0.52 ± 0.72	0.885	0.41 ± 0.96	0.965	0.07 ± 0.74	1.000	-0.04 ± 0.74	0.931
Alexithymia	14.8 ± 4.2	14.3 ± 2.8	15.8 ± 3.1	14.8 ± 3.7	0.5 ± 1.0	0.959	-0.6 ± 1.1	0.963	-1.0 ± 1.2	0.822	-0.6 ± 1.1	0.963
Difficulty Identifying Feelings	3.5 ± 1.7	4.3 ± 2.0	4.6 ± 1.0	4.3 ± 1.5	-0.8 ±0.5	0.384	0.3 ± 0.6	0.953	-1.1 ± 0.5	0.214	0.0 ± 0.5	1.000
Difficulty Describing Feelings	4.3 ± 2.2	4.0 ± 1.8	5.3 ± 2.3	4.8 ± 2.3	0.4 ± 0.6	0.931	0.6 ± 0.8	0.874	-1.0 ± 0.7	0.486	-0.8 ± 0.7	0.641
Externally Orientated Feelings	5.8 ± 2.3	5.8 ± 2.2	5.8 ± 1.3	5.8 ± 1.8	-0.0 ±0.6	1.000	0.0 ± 0.7	1.000	-0.1 ± 0.7	1.000	0.0 ± 0.6	1.000
Perfectionistic Concerns	13.6 ± 3.0	13.6 ± 2.6	12.9 ± 2.4	3.1 ± 2.1	-0.04 ± 0.77	1.000	-0.18 ± 0.93	0.997	0.67 ± 0.79	0.836	0.53 ± 0.90	0.935
Perfectionistic Striving	6.4 ± 1.2	6.2 ± 1.3	6.8 ± 1.2	6.2 ± 1.6	0.17 ± 0.38	0.968	0.60 ± 0.46	0.568	-0.36 ± 0.39	0.800	0.06 ± 0.45	0.999
Self-Esteem	13.9 ± 2.2	13.3 ± 2.8	14.2 ± 1.5	13.4 ± 2.1	0.57 ± 0.66	0.825	0.77 ± 0.79	0.770	-0.24 ± 0.68	0.985	-0.04 ± 0.77	1.000
Extraversion	8.9 ± 1.7	9.2 ± 2.1	8.8 ± 2.1	9.2 ± 2.3	-0.26 ± 0.60	0.972	-0.40 ± 0.72	0.944	0.16 ± 0.62	0.994	0.02 ± 0.70	1.000
Agreeableness	9.1 ± 1.4	8.7 ± 1.7	9.1 ± 2.1	10.5 ± 1.8	0.43 ± 0.52	0.834	-1.4 ± 0.62	0.138	-0.01 ± 0.53	1.000	1.8 ± 0.61	**0.020****
Conscientiousness	9.5 ± 2.8	8.9 ± 2.1	7.6 ± 2.1	10.1 ± 2.8	0.61 ± 0.72	0.831	-2.5 ± 0.87	**0.028****	1.9 ± 0.74	0.064	-1.2 ± 0.84	0.485
Emotional Stability	9.5 ± 2.3	8.9 ± 2.5	8.6 ± 2.2	9.5 ± 2.3	0.61 ± 0.69	0.812	-0.94 ± 0.83	0.672	0.92 ± 0.71	0.570	-0.63 ± 0.81	0.866
Openness	9.9 ± 1.9	9.7 ± 2.0	8.8 ± 1.8	9.3 ± 2.1	0.17 ± 0.57	0.990	-0.52 ± 0.70	0.881	1.1 ± 0.60	0.253	0.43 ± 0.68	0.919
Amotivation	3.2 ± 1.1	3.0 ± 1.5	2.8 ± 0.84	3.1 ± 1.5	0.18 ± 0.54	1.000	-0.34 ± 0.77	1.000	0.38 ± 0.71	1.000	-0.14 ± 0.62	1.000
External Regulation	3.8 ± 2.3	3.3 ± 2.1	2.8 ± 1.3	2.6 ± 1.1	0.51 ± 0.80	1.000	0.23 ± 1.1	1.000	1.0 ± 1.1	1.000	0.74 ± 0.92	1.000
Introjected Regulation	3.9 ± 2.9	4.3 ± 2.5	3.4 ± 1.9	4.1 ± 2.8	-0.40 ± 1.1	1.000	-0.74 ± 1.5	1.000	0.51 ± 0.40	1.000	0.17 ± 0.12	1.000
Identified Regulation	11.1 ± 2.3	9.6 ± 3.9	11.4 ± 2.3	10.3 ± 3.1	1.5 ± 1.3	1.000	1.1 ± 1.8	1.000	-0.31 ± 1.7	1.000	-0.67 ± 1.5	1.000
Integrated Regulation	11.1 ± 2.3	8.7 ± 2.6	11.6 ± 1.7	11.4 ± 2.4	2.4 ± 0.98	0.119	0.17 ± 1.4	1.000	-0.51 ± 1.3	1.000	-2.7 ± 1.1	0.121
IM-General	12.4 ± 1.5	12.5 ± 1.4	13.4 ± 0.89	12.3 ± 1.9	-0.18 ± 0.61	1.000	1.1 ± 0.87	1.000	-1.0 ± 0.80	1.000	0.25 ± 0.70	1.000
Resilience	21.3 ± 2.5	20.8 ± 2.2	22.3 ± 3.2	23.8 ± 2.9	0.52 ± 1.2	1.000	-1.5 ± 1.8	1.000	-0.95 ± 1.5	1.000	-3.0 ± 1.6	0.407
Emotional Intelligence	46.4 ± 4.6	44.2 ± 6.7	46.0 ± 3.5	41.0 ±4.8	2.2 ± 2.2	0.751	5.0 ± 3.2	0.404	0.4 ± 2.9	0.999	3.2 ± 2.5	0.604
Appraisal of Own Emotions	6.8 ± 1.6	7.9 ± 1.3	7.2 ± 1.1	6.7 ± 1.1	-1.1 ± 0.5	0.200	0.5 ± 0.8	0.924	-0.4 ± 0.7	0.951	1.2 ± 0.6	0.234
Appraisal of Others Emotions	7.8 ± 1.1	7.7 ± 1.5	8.2 ± 1.5	7.6 ± 1.7	0.1 ± 0.6	0.996	0.6 ± 0.8	0.874	-0.4 ± 0.8	0.959	0.1 ± 0.7	0.998
Regulation of Own Emotions	8.1 ± 0.8	7.4 ± 1.5	8.0 ± 1.0	7.1 ± 1.3	0.7 ± 0.5	0.511	0.9 ± 0.7	0.641	0.1 ± 0.7	0.999	0.2 ± 0.6	0.975
Regulation of Others Emotions	7.7 ± 1.4	6.9 ± 1.4	7.6 ± 0.9	7.0 ± 1.9	0.8 ± 0.6	0.543	0.6 ± 0.9	0.896	0.1 ± 0.8	0.998	-0.1 ± 0.7	0.999
Utilisation of Emotions	8.1 ± 0.9	7.4 ± 1.4	7.8 ± 0.4	6.3 ± 1.4	0.7 ± 0.5	0.488	1.5 ± 0.7	0.159	0.3 ± 0.6	0.969	1.1 ± 0.6	0.228
Coping Strategies	27.0 ± 2.7	23.2 ± 4.3	31.3 ± 4.9	28.0 ± 5.0	3.8 ± 1.8	0.295	3.3 ± 2.8	1.000	-4.3 ± 2.3	0.495	-4.8 ± 2.4	0.339
Coping with Adversity	4.1 ± 0.88	3.2 ±1.5	4.3 ± 0.50	3.8 ± 1.7	0.88 ± 0.56	0.777	0.50 ± 0.86	1.000	-0.15 ± 0.72	1.000	-0.53 ± 0.73	1.000
Performing Under Pressure	4.1 ± 1.3	3.4 ± 1.3	4.8 ± 1.3	4.3 ± 1.3	0.66 ± 0.60	1.000	0.50 ± 0.92	1.000	-0.65 ± 0.77	1.000	-0.81 ± 0.78	1.000
Mental Preparation	2.7 ± 1.5	2.8 ± 1.7	4.8 ± 1.5	2.8 ± 0.96	-0.08 ± 0.70	1.000	2.0 ± 1.1	0.454	-2.1 ± 0.90	0.193	0.03 ± 0.91	1.000
Concentration	4.2 ± 0.63	3.7 ± 0.71	5.3 ± 0.96	4.5 ± 0.58	0.05 ± 0.90	0.672	0.75 ± 0.50	0.868	-1.1 ± 0.42	0.113	-0.83 ± 0.42	0.363
Free from Worry	2.7 ± 1.6	2.7 ± 0.87	2.8 ± 1.3	4.0 ± 0.82	0.03 ± 0.57	1.000	-1.3 ± 0.87	0.987	-0.01 ± 0.73	1.000	-1.3 ± 0.74	0.508
Achievement Motivation	3.7 ± 1.1	3.0 ± 0.71	4.0 ± 0.82	3.8 ± 1.3	0.70 ± 0.44	0.739	0.25 ± 0.67	1.000	-0.30 ± 0.56	1.000	-0.75 ± 0.57	1.000
Coachability	5.5 ± 0.97	4.4 ± 1.1	5.5 ± 1.0	5.0 ± 1.2	1.1 ± 0.49	0.242	0.50 ± 0.75	1.000	0.00 ± 0.64	1.000	-0.56 ± 0.64	1.000

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 12: Birthdate distribution effect on psychological differences (Mean ± Standard Deviation) in Elite Under 18s Rugby Union

Elite Under 18s	Regional H1	Regional H2	Club H1	Club H2	Regional (H1 vs H2)	Sig.	Club (H1 vs H2)	Sig.	Regional Vs Club (H1 vs H1)	Sig.	Regional Vs Club (H2 vs H2)	Sig.
Outcome Focus	9.0 ± 1.4	8.6 ± 1.5	8.8 ± 1.3	8.3 ± 1.6	0.35 ± 0.58	0.927	0.43 ± 0.32	0.541	0.21 ± 0.38	0.366	0.29 ± 0.54	0.952
Mastery Focus	9.2 ± 1.1	9.1 ± 1.1	9.1 ± 1.1	8.9 ± 1.2	0.07 ± 0.45	0.999	0.23 ± 0.25	0.801	0.11 ± 0.30	0.981	0.27 ± 0.42	0.917
Commitment	7.8 ± 1.4	8.4 ± 0.67	7.7 ± 1.2	7.5 ± 1.1	-0.78 ± 0.44	0.284	0.24 ± 0.27	0.794	-0.17 ± 0.32	0.954	0.96 ± 0.40	0.144
Athlete Burnout	33.6 ± 4.9	26.9 ± 5.1	30.5 ± 7.0	33.6 ± 7.1	6.7 ± 2.5	**0.038****	-3.1 ± 1.5	0.170	3.2 ± 1.8	0.297	-6.6 ± 2.3	**0.021****
Exhaustion	11.2 ± 2.8	9.3 ± 2.2	9.5 ± 2.9	11.3 ± 3.4	1.9 ± 1.1	0.170	-1.8 ± 0.69	0.053	1.7 ± 0.82	0.185	-2.0 ± 1.0	0.226
RS. Accomplishment	14.0 ± 1.9	10.1 ± 2.0	12.8 ± 2.8	12.9 ± 2.9	3.9 ± 1.0	**0.001****	-0.09 ± 0.60	0.999	1.2 ± 0.73	0.330	-2.8 ± 0.91	**0.016****
Sport Devaluation	8.5 ± 2.2	7.5 ± 2.3	8.2 ± 2.7	9.4 ± 3.3	0.93 ± 1.1	0.818	-1.2 ± 0.64	0.228	0.26 ± 0.77	0.986	-1.9 ± 0.97	0.214
Life Stress	7.7 ± 3.0	7.8 ± 1.2	7.2 ± 1.9	7.4 ± 2.4	-0.1 ± 0.9	0.999	-0.2 ± 0.5	0.986	0.5 ± 0.6	0.864	0.4 ± 0.9	0.961
Training stress	8.0 ± 3.1	8.0 ± 1.3	7.2 ± 2.1	6.9 ± 2.5	0.0 ± 1.0	1.000	0.3 ± 0.5	0.942	0.9 ± 0.7	0.545	1.1 ± 0.9	0.586
Athlete Identity	6.7 ± 1.3	6.5 ± 2.0	6.2 ± 2.1	6.2 ± 1.9	0.23 ± 0.73	0.989	-0.04 ± 0.44	0.999	0.50 ± 0.53	0.782	0.22 ± 0.67	0.988
Optimism	14.6 ± 2.2	14.5 ± 3.2	14.2 ± 2.4	14.1 ± 2.3	0.18 ± 0.92	0.997	0.09 ± 0.56	0.998	0.42 ± 0.67	0.923	0.34 ± 0.85	0.978
Alexithymia	15.1 ± 2.5	15.3 ± 3.2	15.2 ± 2.8	14.5 ± 3.2	-0.2 ± 1.3	0.998	0.7 ± 0.8	0.811	-0.1 ± 0.9	1.000	0.8 ± 1.2	0.908
Difficulty Identifying Feelings	4.6 ± 1.3	4.6 ± 1.3	3.9 ± 1.5	4.3 ± 1.8	0.1 ± 0.6	1.000	-0.4 ± 0.4	0.748	0.7 ± 0.4	0.401	0.2 ± 0.6	0.974
Difficulty Describing Feelings	4.7 ± 1.3	5.1 ± 2.0	4.7 ± 2.2	4.3 ± 2.0	-0.4 ± 0.8	0.960	0.4 ± 0.5	0.803	-0.0 ± 0.5	1.000	0.8 ± 0.7	0.700
Externally Orientated Feelings	5.8 ± 1.8	5.7 ± 0.9	5.8 ± 1.9	5.8 ± 2.0	0.1 ± 0.7	0.999	0.0 ± 0.4	1.000	-0.0 ± 0.5	1.000	-0.1 ± 0.7	0.999
Perfectionistic Concerns	13.3 ± 3.1	14.7 ± 2.2	13.3 ± 2.7	13.4 ± 2.4	-1.4 ± 1.1	0.576	-0.16 ± 0.60	0.993	0.06 ± 0.70	0.999	1.3 ± 0.99	0.588
Perfectionistic Striving	7.2 ± 1.3	6.9 ± 1.1	6.6 ± 1.2	6.2 ± 1.4	0.34 ± 0.50	0.907	0.36 ± 0.29	0.586	0.67 ± 0.33	0.191	0.69 ± 0.47	0.461
Self-Esteem	13.9 ± 2.9	13.3 ± 3.2	13.7 ± 2.0	13.8 ± 2.0	0.58 ± 0.88	0.913	-0.07 ± 0.53	0.999	0.11 ± 0.64	0.998	-0.53 ± 0.81	0.912
Extraversion	8.6 ± 1.8	10.7 ± 1.5	9.0 ± 2.0	8.9 ± 1.9	-2.1 ± 0.71	**0.018****	0.04 ± 0.43	1.000	-0.35 ± 0.52	0.904	1.8 ± 0.66	**0.034****
Agreeableness	8.8 ± 1.7	8.7 ± 1.9	9.0 ± 1.5	9.4 ± 2.2	0.02 ± 0.68	1.000	-0.37 ± 0.41	0.812	-0.27 ± 0.49	0.945	-0.66 ± 0.62	0.715
Conscientiousness	8.4 ± 2.2	10.5 ± 1.9	8.6 ± 2.3	9.6 ± 2.6	-2.2 ± 0.89	0.072	-0.94 ± 0.54	0.310	-0.27 ± 0.65	0.975	0.99 ± 0.82	0.622
Emotional Stability	8.4 ± 2.3	11.5 ± 1.8	8.6 ± 1.9	9.6 ± 2.5	-3.2 ± 0.81	**0.001****	-0.97 ± 0.49	0.206	-0.29 ± 0.59	0.959	1.9 ± 0.75	0.052
Openness	9.2 ± 2.0	11.1 ± 2.0	9.0 ± 1.8	9.5 ± 2.1	-1.9 ± 0.73	**0.045****	-0.42 ± 0.44	0.774	0.10 ± 0.53	0.997	1.6 ± 0.67	0.082
Amotivation	3.8 ± 2.2	3.0 ± 1.0	3.1 ± 0.99	3.1 ± 1.5	0.83 ± 0.81	0.734	0.03 ± 0.53	1.000	0.70 ± 0.59	0.639	-0.11 ± 0.77	0.999
External Regulation	3.3 ± 1.5	3.2 ± 1.1	3.5 ± 2.1	3.1 ± 1.9	0.05 ± 0.53	1.000	0.43 ± 0.63	0.906	-0.28 ± 0.71	0.978	-0.09 ± 0.92	1.000
Introjected Regulation	4.5 ± 2.4	6.4 ± 4.3	3.7 ± 2.7	4.1 ± 2.5	-1.9 ± 1.5	0.561	-0.37 ± 0.94	0.979	0.77 ± 1.1	0.886	-2.3 ± 1.4	0.348
Identified Regulation	11.5 ± 2.0	11.2 ± 1.6	11.0 ± 2.2	10.0 ± 3.6	0.30 ± 1.5	0.997	1.0 ± 0.95	0.722	0.50 ± 1.1	0.966	1.2 ± 1.4	0.823
Integrated Regulation	11.3 ± 2.3	10.4 ± .55	11.1 ± 2.1	9.8 ± 2.8	0.85 ± 1.2	0.903	1.3 ± 0.81	0.400	0.18 ± 0.91	0.997	0.61 ± 1.2	0.954
IM-General	12.8 ± 1.1	12.8 ± 2.2	12.7 ± 1.4	12.6 ± 1.3	0.03 ± 0.75	1.000	0.04 ± 0.49	1.000	0.17 ± 0.55	0.990	0.17 ± 0.71	0.995
Resilience	21.3 ± 3.0	19.8 ± 3.3	21.7 ± 2.5	22.1 ± 4.3	1.5 ± 1.8	0.839	-0.44 ± 1.2	0.983	-0.33 ± 1.3	0.995	-2.3 ± 1.7	0.553
Emotional Intelligence	47.0 ± 4.9	41.4 ± 6.0	46.3 ± 4.2	43.1 ± 6.2	5.6 ± 2.9	0.221	3.2 ± 1.8	0.290	0.8 ± 2.1	0.984	-1.7 ± 2.7	0.925
Appraisal of Own Emotions	7.6 ± 0.9	7.0 ± 1.4	6.9 ± 1.4	7.5 ± 1.5	0.6 ± 0.7	0.799	-0.6 ± 0.4	0.570	0.7 ± 0.5	0.519	-0.5 ± 0.6	0.867
Appraisal of Others Emotions	7.6 ± 1.2	7.2 ± 1.1	7.9 ± 1.2	7.7 ± 1.5	0.4 ± 0.7	0.929	0.3 ± 0.4	0.917	-0.3 ± 0.5	0.938	-0.5 ± 0.7	0.905
Regulation of Own Emotions	8.3 ± 1.1	7.0 ± 0.7	8.1 ± 0.9	7.3 ± 1.4	1.3 ± 0.6	0.183	0.8 ± 0.4	0.210	0.2 ± 0.4	0.966	-0.3 ± 0.6	0.953
Regulation of Others Emotions	7.5 ± 1.3	6.6 ± 0.9	7.7 ±1.3	7.0 ± 1.5	0.9 ± 0.7	0.572	0.7 ± 0.5	0.377	-0.1 ± 0.5	0.993	-0.4 ± 0.7	0.955
Utilisation of Emotions	8.3 ± 1.1	6.6 ± 2.2	8.0 ± 0.8	7.0 ± 1.5	1.7 ± 0.7	0.100	1.0 ± 0.4	0.121	0.3 ± 0.5	0.952	-0.4 ± 0.7	0.929
Coping Strategies	26.8 ± 4.0	22.8 ± 4.9	28.2 ± 5.1	25.2 ± 5.1	4.1 ± 2.6	0.411	3.0 ± 1.7	0.310	-1.4 ± 1.8	0.866	-2.5 ± 2.5	0.764
Coping with Adversity	4.5 ± 1.1	3.0 ± 1.2	4.2 ± 0.73	3.5 ± 1.5	1.5 ± 0.69	0.166	0.73 ± 0.45	0.383	0.22 ± 0.48	0.966	-0.50 ± 0.67	0.876
Performing Under Pressure	4.5 ± 1.1	2.5 ± 1.3	4.3 ± 1.3	3.8 ± 1.3	2.0 ± 0.74	0.055	0.52 ± 0.49	0.709	0.15 ± 0.52	0.992	-1.3 ± 0.72	0.293
Mental Preparation	3.0 ± 1.6	2.3 ± 1.3	3.3 ± 1.8	2.8 ± 1.4	0.75 ± 0.93	0.850	0.52 ± 0.61	0.829	-0.31 ± 0.65	0.965	-0.54 ± 0.90	0.933
Concentration	4.0 ± 1.1	3.5 ± .58	4.5 ± 0.88	4.0 ± .78	0.50 ± 0.52	0.773	0.46 ± 0.34	0.542	-0.46 ± 0.37	0.591	-0.50 ± 0.51	0.757
Free from Worry	2.7 ± 1.3	4.0 ± 1.6	2.5 ± 1.3	3.1 ± 1.0	-1.3 ± 0.73	0.314	-0.60 ± 0.48	0.595	0.19 ± 0.51	0.983	0.86 ± 0.71	0.623
Achievement Motivation	3.7 ± 1.2	3.3 ± 1.5	3.9 ± 0.86	3.3 ± 0.91	0.48 ± 0.60	0.859	0.64 ± 0.40	0.391	-0.20 ± 0.42	0.967	-0.04 ± 0.59	1.000
Coachability	4.5 ± 0.93	4.3 ± .50	5.5 ± 0.97	4.7 ± 1.1	0.20 ± 0.58	0.985	0.75 ± 0.38	0.224	-1.0 ± 0.41	0.081	-0.46 ± 0.56	0.843

Key: Sig. = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 13: Birthdate distribution effect on psychological differences (Mean ± Standard Deviation) in Under 16s Forwards Rugby Union

Under 16s Forwards	Regional H1	Regional H2	Club H1	Club H2	Regional (H1 vs H2)	Sig.	Club (H1 vs H2)	Sig.	Regional Vs Club (H1 vs H1)	Sig.	Regional Vs Club (H2 vs H2)	Sig.
Outcome Focus	8.1 ± 1.8	8.7 ± 1.3	8.0 ± 1.5	8.8 ± 1.0	-0.52 ± 0.48	0.690	-0.75 ± 0.50	0.451	0.14 ± 0.44	0.988	-0.08 ± 0.53	0.999
Mastery Focus	9.1 ± 1.7	9.3 ± 0.73	9.2 ± 1.7	9.0 ± 0.97	-0.23 ± 0.45	0.958	0.16 ± 0.48	0.987	-0.05 ± 0.42	0.999	0.33 ± 0.51	0.912
Commitment	8.3 ± 0.89	8.7 ± 0.82	8.3 ± 1.2	8.1 ± 1.0	-0.42 ± 0.31	0.551	0.25 ± 0.33	0.873	-0.07 ± 0.29	0.996	0.60 ± 0.35	0.327
Athlete Burnout	28.7 ± 5.5	26.4 ± 6.2	30.1 ± 7.5	29.6 ± 5.5	2.2 ± 1.9	0.656	0.54 ± 2.1	0.307	-1.4 ± 1.8	0.865	-3.1 ± 2.2	0.485
Exhaustion	8.7 ± 2.7	8.3 ± 2.4	9.2 ± 3.3	9.9 ± 2.6	0.37 ± 0.87	0.975	-0.72 ± 0.94	0.871	-0.48 ± 0.83	0.938	-1.6 ± 0.98	0.389
RS. Accomplishment	12.3 ± 2.0	11.1 ± 2.9	13.1 ± 3.1	12.3 ± 2.9	1.1 ± 0.93	0.624	0.80 ± 1.0	0.856	-0.80 ± 0.88	0.800	-1.1 ± 1.1	0.709
Sport Devaluation	7.8 ± 2.8	7.0 ± 2.2	7.9 ± 2.8	7.4 ± 2.3	0.75 ± 0.81	0.793	0.46 ± 0.88	0.954	-0.15 ± 0.77	0.998	-0.44 ± 0.92	0.964
Life Stress	6.7 ± 2.6	6.5 ± 2.8	6.8 ± 2.5	8.3 ± 3.0	0.2 ± 0.8	0.992	-1.5 ± 0.9	0.388	-0.1 ± 0.8	0.999	-1.8 ± 0.9	0.188
Training stress	6.4 ± 2.4	6.3 ± 2.3	6.4 ± 2.8	7.5 ± 2.9	0.0 ± 0.7	1.000	-1.1 ± 0.9	0.564	-0.0 ± 0.8	1.000	-1.2 ± 0.8	0.500
Athlete Identity	6.9 ± 1.6	7.4 ± 1.7	7.1 ± 1.2	7.0 ± 1.4	-0.52 ± 0.46	0.680	0.05 ± 0.50	1.000	-0.20 ± 0.44	0.970	0.38 ± 0.52	0.890
Optimism	14.3 ± 2.2	14.1 ± 2.1	13.8 ± 2.7	13.5 ± 2.5	0.20 ± 0.75	0.994	0.29 ± 0.81	0.984	0.53 ± 0.71	0.692	0.63 ± 0.84	0.880
Alexithymia	15.6 ± 2.5	14.4 ± 2.7	16.0 ± 3.0	16.3 ± 2.9	1.2 ± 0.8	0.383	0.3 ± 0.9	0.993	-0.4 ± 0.8	0.960	-1.9 ± 0.9	0.165
Difficulty Identifying Feelings	5.1 ± 1.6	4.0 ± 2.0	5.0 ± 1.9	5.2 ± 1.8	1.1 ± 0.5	0.162	-0.2 ± 0.6	0.990	0.1 ± 0.5	0.999	-1.2 ± 0.6	0.198
Difficulty Describing Feelings	4.9 ± 1.7	4.5 ± 1.9	4.4 ± 1.9	5.5 ± 1.9	0.4 ± 0.5	0.890	-1.1 ± 0.6	0.307	0.4 ± 0.5	0.838	-1.0 ± 0.6	0.346
Externally Orientated Feelings	5.7 ± 1.3	5.9 ± 1.6	6.3 ± 2.0	5.6 ± 1.5	-0.2 ± 0.4	0.970	0.7 ± 0.5	0.557	-0.6 ± 0.5	0.569	0.3 ± 0.5	0.937
Perfectionistic Concerns	13.9 ± 3.9	12.5 ± 2.8	13.6 ± 3.5	13.8 ± 3.1	1.4 ± 1.1	0.591	-0.12 ± 1.2	1.000	0.23 ± 1.0	0.996	-1.3 ± 1.2	0.733
Perfectionistic Striving	7.3 ± 1.2	6.9 ± 1.6	6.8 ± 1.4	6.7 ± 1.4	0.45 ± 0.43	0.730	0.10 ± 0.47	0.996	0.53 ± 0.41	0.567	0.19 ± 0.49	0.980
Self-Esteem	14.0 ± 2.3	12.4 ± 3.6	13.5 ± 1.6	14.7 ± 2.3	1.6 ± 0.78	0.166	-1.2 ± 0.84	0.516	0.47 ± 0.74	0.918	-2.3 ± 0.88	**0.049****
Extraversion	8.9 ± 2.3	9.9 ± 2.2	8.8 ± 1.5	8.6 ± 1.7	-1.0 ± 0.62	0.373	0.17 ± 0.67	0.995	0.14 ± 0.59	0.995	1.3 ± 0.70	0.250
Agreeableness	9.1 ± 1.9	9.4 ± 1.4	9.3 ± 1.9	7.9 ± 2.1	-0.33 ± 0.57	0.936	1.4 ± 0.64	0.113	-0.20 ± 0.56	0.983	1.6 ± 0.64	0.077
Conscientiousness	9.4 ± 2.5	10.1 ± 3.0	8.2 ± 3.0	10.4 ± 2.3	-0.63 ± 0.79	0.852	-2.2 ± 0.85	0.052	1.2 ± 0.75	0.369	-0.38 ± 0.89	0.975
Emotional Stability	9.4 ± 2.4	9.6 ± 2.7	8.9 ± 2.5	9.5 ± 2.5	0.02 ± 0.78	1.000	-0.61 ± 0.85	0.891	0.75 ± 0.74	0.744	0.13 ± 0.88	0.999
Openness	9.0 ± 2.2	9.7 ± 2.5	8.8 ± 2.1	9.8 ± 1.8	-0.69 ± 0.68	0.740	-0.97 ± 0.73	0.549	0.16 ± 0.64	0.995	-0.13 ± 0.76	0.998
Amotivation	2.5 ± 0.85	4.3 ± 2.8	4.1 ± 2.6	3.7 ± 2.1	-1.8 ± 0.98	0.274	0.43 ± 0.99	0.971	-1.6 ± 1.0	0.413	0.61 ± 0.92	0.912
External Regulation	2.3 ± 0.67	3.8 ± 2.4	2.5 ± 1.1	3.8 ± 2.3	-1.5 ± 0.84	0.293	-1.3 ± 0.84	1.000	-0.20 ± 0.89	0.996	-0.05 ± 0.79	1.000
Introjected Regulation	3.6 ± 2.0	4.2 ± 2.9	3.4 ± 3.5	5.2 ± 3.2	-0.60 ± 1.3	0.968	-1.8 ± 1.3	0.542	-1.6 ± 1.2	0.998	-0.95 ± 1.2	0.868
Identified Regulation	11.9 ± 1.8	10.2 ± 3.2	11.3 ± 2.6	10.9 ± 2.1	1.7 ± 1.1	0.416	0.33 ± 1.1	0.991	0.65 ± 1.2	0.943	-0.72 ± 1.0	0.895
Integrated Regulation	11.7 ± 2.2	10.1 ± 2.6	10.8 ± 1.4	11.2 ± 3.0	1.6 ± 1.1	0.483	-0.40 ± 1.1	0.984	0.95 ± 1.2	0.851	-1.1 ± 1.0	0.745
IM-General	13.2 ± 1.2	11.9 ± 3.1	13.9 ± 0.35	11.5 ± 3.3	1.3 ± 1.1	0.659	2.4 ± 1.1	0.162	-0.68 ± 1.2	0.942	0.44 ± 1.1	0.976
Resilience	23.9 ± 3.3	24.2 ± 3.5	23.6 ± 4.5	21.0 ± 2.4	-0.30 ± 1.5	0.997	2.6 ± 1.5	0.320	0.28 ± 1.6	0.998	3.2 ± 1.4	0.126
Emotional Intelligence	44.7 ± 5.5	43.7 ± 6.2	46.9 ± 4.0	44.1 ± 4.3	1.0 ± 2.0	0.955	2.8 ± 2.3	0.627	-2.2 ± 2.3	0.781	-0.4 ± 2.1	0.997
Appraisal of Own Emotions	7.6 ± 1.4	5.9 ± 2.2	7.1 ± 1.0	7.1 ± 1.8	1.7 ± 0.7	0.082	0.0 ± 0.8	1.000	0.4 ± 0.8	0.935	-1.2 ± 0.7	0.340
Appraisal of Others Emotions	7.6 ± 1.4	7.3 ± 1.1	8.3 ± 1.4	7.4 ± 1.4	0.4 ± 0.5	0.876	0.9 ± 0.6	0.477	-0.6 ± 0.6	0.733	-0.1 ± 0.5	0.994
Regulation of Own Emotions	8.1 ± 1.6	8.2 ± 1.5	9.0 ± 1.4	7.5 ± 1.2	-0.0 ± 0.6	1.000	1.5 ± 0.6	0.095	-0.9 ± 0.6	0.539	0.7 ± 0.6	0.613
Regulation of Others Emotions	6.8 ± 1.1	6.9 ± 2.2	6.8 ± 1.0	6.8 ± 1.0	-0.1 ± 0.6	0.996	0.3 ± 0.6	0.973	-0.3 ± 0.6	0.951	0.1 ± 0.6	0.999
Utilisation of Emotions	7.4 ± 1.7	8.0 ± 1.3	8.0 ± 1.2	8.1 ± 0.9	-0.6 ± 0.5	0.689	-0.1 ± 0.6	0.999	-0.6 ± 0.6	0.761	-0.1 ± 0.5	0.999
Coping Strategies	28.0 ± 4.8	28.1 ± 5.9	28.4 ± 6.0	25.9± 4.4	-0.11 ± 2.4	1.000	2.5 ± 2.6	0.769	-0.38 ± 2.5	0.999	2.2 ± 2.6	0.810
Coping with Adversity	4.3 ± 1.2	4.2 ± 1.5	4.5 ± 1.3	3.3 ± 1.6	0.05 ± 0.62	1.000	1.2 ± 0.68	0.326	-0.22 ± 0.65	0.985	0.89 ± 0.66	0.535
Performing Under Pressure	4.1 ± 1.4	3.8 ± 0.97	4.6 ± 1.1	3.6 ± 1.3	0.31 ± 0.52	0.931	1.1 ± 5.6	0.250	-0.53 ± 0.54	0.757	0.22 ± 0.55	0.977
Mental Preparation	3.3 ± 1.3	2.8 ± 0.83	3.1 ± 1.5	3.3 ± 1.3	0.49 ± 0.56	0.810	-0.21 ± 0.60	0.985	0.15 ± 0.58	0.994	-0.56 ± 0.58	0.777
Concentration	4.2 ± 1.2	4.2 ± 1.4	4.8 ± 1.0	4.3 ± 1.5	-0.04 ± 0.58	1.000	0.42 ± 0.53	0.909	0.57 ± 0.60	0.778	-0.11 ± 0.61	0.998
Free from Worry	3.1 ± 1.3	4.0 ± 1.1	3.1 ± 1.4	3.1 ± 0.78	-0.91 ± 0.52	0.321	-0.01 ± 0.57	1.000	-0.03 ± 0.54	1.000	0.89 ± 0.55	0.381
Achievement Motivation	4.0 ± 0.77	4.2 ± 1.3	3.4 ± 1.0	3.4 ± 1.0	-0.22 ± 0.45	0.961	-0.07 ± 0.49	0.999	0.63 ± 0.47	0.550	0.78 ± 0.48	0.374
Coachability	5.1 ± 1.1	4.9 ± 1.2	4.9 ± 0.99	4.8 ± 1.5	0.20 ± 0.54	0.982	0.10 ± 0.59	0.998	0.22 ± 0.56	0.980	0.11 ± 0.57	0.997

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 14: Birthdate distribution effect on psychological differences (Mean ± Standard Deviation) in Under 18s Forwards Rugby Union

Under 18s Forwards	Regional H1	Regional H2	Club H1	Club H2	Regional (H1 vs H2)	*P*	Club (H1 vs H2)	*P*	Regional Vs Club (H1 vs H1)	*P*	Regional Vs Club (H2 vs H2)	*P*
Outcome Focus	8.6 ± 0.35	8.8 ± 0.43	9.2 ± 0.83	NO DATA	-0.20 ± 0.55	0.929	NO DATA		-0.57 ± 0.52	0.525	NO DATA	
Mastery Focus	8.9 ± 1.4	9.2 ± 0.92	9.1 ± 1.0		-0.27 ± 0.47	0.840			-0.15 ± 0.45	0.940		
Commitment	7.9 ± 1.2	7.5 ± 1.1	7.9 ± 0.90		0.37 ± 0.44	0.683			-0.05 ± 0.42	0.992		
Athlete Burnout	27.9 ± 4.3	30.6 ± 6.3	32.4 ± 5.9		-2.7 ± 2.2	0.457			-4.5 ± 2.1	0.097		
Exhaustion	8.3 ± 1.9	10.0 ± 3.2	10.3 ± 2.3		-1.7 ± 1.0	0.235			-1.9 ± 0.95	0.125		
RS. Accomplishment	11.3 ± 2.2	12.8 ± 2.5	13.4 ± 3.0		-1.5 ± 1.0	0.349			-2.1 ± 0.99	0.104		
Sport Devaluation	8.3 ± 2.3	7.8 ± 2.4	8.8 ± 2.5		0.47 ± 0.97	0.881			-0.48 ± 0.92	0.860		
Life Stress	7.4 ± 2.0	7.9 ± 3.4	7.1 ± 1.5		-0.5 ± 1.0	0.962			0.2 ± 1.1	0.996		
Training stress	7.1 ± 2.2	6.9 ± 3.9	7.1 ± 2.1		0.3 ± 1.1	0.996			-0.0 ± 1.2	1.000		
Athlete Identity	6.5 ± 16	6.8 ± 1.5	6.6 ± 2.4		-0.27 ± 0.76	0.935			-0.05 ± 0.72	0.997		
Optimism	15.1 ± 2.4	14.4 ± 1.8	13.0 ± 1.8		0.73 ± 1.1	0.791			2.1 ± 0.93	0.077		
Alexithymia	16.3 ± 2.8	15.9 ± 2.2	15.3 ± 1.8		0.4 ± 1.1	0.987			1.0 ± 1.2	0.846		
Difficulty Identifying Feelings	3.8 ± 1.3	5.6 ± 1.8	4.3 ± 1.0		-1.8 ± 0.6	**0.019****			-0.5 ± 0.6	0.863		
Difficulty Describing Feelings	4.8 ± 1.8	4.9 ± 1.4	4.6 ± 2.0		-0.1 ± 0.7	1.000			0.2 ± 0.8	0.988		
Externally Orientated Feelings	6.2 ± 1.5	5.9 ± 1.6	6.3 ± 0.8		0.3 ± 0.6	0.959			-0.1 ± 0.71.2	0.999		
Perfectionistic Concerns	13.7 ± 2.1	13.2 ± 1.8	12.5 ± 2.4		0.53 ± 1.0	0.866			± 0.99	0.434		
Perfectionistic Striving	6.1 ± 1.1	6.0 ± 0.47	6.6 ± 1.4		0.13 ± 0.46	0.954			-0.45 ± 0.43	0.559		
Self-Esteem	13.9 ± 2.5	13.7 ± 2.5	14.3 ± 1.1		0.17 ± 0.87	0.980			-0.38 ± 0.82	0.888		
Extraversion	8.3 ± 1.2	9.5 ± 2.5	8.9 ± 3.0		-1.2 ± 0.94	0.435			-0.58 ± 0.89	0.790		
Agreeableness	9.1 ± 1.4	8.6 ± 1.9	9.7 ± 2.3		0.47 ± 0.77	0.819			-0.60 ± 0.73	0.695		
Conscientiousness	9.2 ± 2.7	8.1 ± 1.8	7.2 ± 2.6		1.1± 1.0	0.519			2.0 ± 0.95	0.095		
Emotional Stability	9.7 ± 2.3	8.5 ± 2.5	9.3 ± 2.8		1.2 ± 1.0	0.498			0.33 ± 0.97	0.937		
Openness	10.0 ± 1.7	9.8 ± 2.3	8.9 ± 2.2		0.20 ± 0.84	0.969			1.1 ± .81	0.383		
Amotivation	3.2 ± 1.6	3.2 ± 1.6	3.3 ± 0.58		0.33 ± 0.67	0.873			0.17 ± 0.83	0.979		
External Regulation	4.4 ± 2.5	3.0 ± 1.5	2.3 ± 0.58		1.4 ± 1.1	0.436			2.0 ± 1.4	0.320		
Introjected Regulation	4.5 ± 3.2	4.7 ± 2.4	3.0 ± 1.5		-0.17 ± 1.5	0.993			1.5 ± 1.9	0.709		
Identified Regulation	11.9 ± 1.6	9.7 ± 4.0	10.7 ± 2.9		2.2 ± 1.6	0.360			1.2 ± 2.0	0.813		
Integrated Regulation	11.9 ± 1.8	8.5 ± 2.6	11.0 ± 2.0		3.4 ± 1.2	**0.029****			0.88 ± 1.5	0.821		
IM-General	13.0 ± 0.93	12.7 ± 0.82	13.0 ± 1.0		0.33 ± 0.49	0.775			0.00 ± 0.61	1.000		
Resilience	21.4 ± 2.7	21.0 ± 3.0	23.0 ± 3.5		0.38 ± 1.6	0.969			-1.6 ± 2.0	0.693		
Emotional Intelligence	47.0 ± 5.1	42.8 ± 5.0	46.3 ± 2.1		4.2 ± 2.5	0.264			0.7 ± 3.2	0.976		
Appraisal of Own Emotions	7.1 ± 1.7	7.5 ± 1.2	7.3 ± 1.2		-0.4 ± 0.8	0.888			-0.2 ± 1.0	0.977		
Appraisal of Others Emotions	7.9 ± 1.0	7.3 ± 1.2	8.3 ± 0.6		0.5 ± 0.6	0.671			-0.5 ± 0.8	0.831		
Regulation of Own Emotions	8.1 ± 0.8	7.3 ± 1.5	8.7 ± 0.6		0.8 ± 0.5	0.308			-0.5 ± 0.6	0.689		
Regulation of Others Emotions	7.6 ± 1.6	7.5 ± 1.0	7.6 ± 1.2		0.1 ± 0.7	0.984			-0.0 ± 0.9	0.999		
Utilisation of Emotions	8.1 ± 1.0	7.5 ± 1.0	7.7 ± 0.6		0.6 ± 0.6	0.520			0.5 ± 0.7	0.794		
Coping Strategies	26.6 ± 3.1	21.5 ± 4.8	30.7 ± 5.9		5.1 ± 2.6	0.179			-4.1 ± 2.9	0.370		
Coping with Adversity	4.0 ± 1.0	3.3 ± 1.9	4.3 ± 0.58		0.75 ± 0.79	0.621			-0.33 ± 0.87	0.923		
Performing Under Pressure	4.0 ± 1.4	3.0 ± 1.4	4.7 ± 1.5		1.0 ± 0.90	0.527			-0.67 ± 0.99	0.784		
Mental Preparation	2.6 ± 1.7	2.8 ± 1.7	4.3 ± 1.5		-0.18 ± 1.1	0.984			-1.8 ± 1.1	0.320		
Concentration	4.3 ± 0.49	3.5 ± 0.58	5.3 ± 1.2		0.79 ± 0.43	0.202			-1.0 ± 0.47	0.110		
Free from Worry	3.0 ± 1.5	2.5 ± 1.0	2.7 ± 1.5		0.50 ± 0.88	0.839			0.33 ± 0.97	0.937		
Achievement Motivation	3.4 ± 1.1	3.0 ± 0.00	4.0 ± 1.0		0.43 ± 0.59	0.753			-0.57 ± 0.65	0.663		
Coachability	5.3 ± 1.1	3.5 ± 0.58	5.3 ± 1.2		1.8 ± 0.63	**0.040****			-0.05 ± 0.69	0.997		

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 15: Birthdate distribution effect on psychological differences (Mean ± Standard Deviation) in Elite Under 18s Forwards Rugby Union

Elite Under 18s Forwards	Regional H1	Regional H2	Club H1	Club H2	Regional (H1 vs H2)	*P*	Club (H1 vs H2)	*P*	Regional Vs Club (H1 vs H1)	*P*	Regional Vs Club (H2 vs H2)	*P*
Outcome Focus	9.2 ± 1.3	8.3 ± 1.5	8.8 ± 1.3	9.0 ± 1.3	0.85 ± 0.83	0.730	-0.19 ± 0.47	0.979	0.37 ± 0.41	0.805	-0.67 ± 0.85	0.863
Mastery Focus	9.5 ± 0.73	9.7 ± 0.58	9.0 ± 1.2	8.9 ± 1.0	-0.17 ± 0.64	0.994	0.13 ± 0.36	0.985	0.46 ± 0.32	0.477	0.76 ± 0.66	0.663
Commitment	7.6 ± 1.1	7.7 ± 0.58	7.9 ± 1.1	7.4 ± 0.92	-0.10 ± 0.65	0.999	0.56 ± 0.37	0.435	-0.36 ± 0.33	0.685	0.30 ± 0.68	0.970
Athlete Burnout	32.3 ± 4.4	26.8 ± 4.8	28.4 ± 7.3	33.7 ± 5.6	5.5 ± 3.5	0.391	-5.3 ± 2.2	0.099	3.9 ± 2.1	0.260	-7.0 ± 3.6	0.220
Exhaustion	10.7± 2.9	9.8 ± 2.1	9.0 ± 2.9	11.5 ± 3.2	0.96 ± 1.6	0.938	-2.5 ± 1.1	0.107	1.8 ± 0.99	0.301	-1.7 ± 1.7	0.753
RS. Accomplishment	13.9 ± 1.9	10.0 ± 2.6	11.9 ± 3.1	13.9 ± 2.4	3.9 ± 1.5	0.060	-2.0 ± 0.96	0.178	1.9 ± 0.89	0.144	-3.9 ± 1.5	0.066
Sport Devaluation	7.4 ± 2.2	6.7 ± 2.1	8.2 ± 2.3	9.0 ± 3.2	0.71 ± 1.6	0.968	-0.82 ± 0.89	0.794	-0.81 ± 0.78	0.728	-2.3 ± 1.6	0.476
Life Stress	7.1 ± 2.5	7.3 ± 0.6	7.3 ± 0.6	7.5 ± 3.1	-0.3 ± 1.5	0.998	-0.2 ± 0.8	0.995	-0.2 ± 0.8	0.990	-0.2 ± 1.5	0.995
Training stress	7.3 ± 2.7	7.3 ± 0.6	7.3 ± 0.6	6.3 ± 3.4	-0.1 ± 1.6	1.000	0.9 ± 0.9	0.775	0.1 ± 0.9	0.999	1.1 ± 1.7	0.775
Athlete Identity	6.6 ± 2.0	6.0 ± 1.0	6.6 ± 1.8	6.4 ± 2.0	0.56 ± 1.2	0.964	0.19 ± 0.67	0.992	0.01 ± 0.59	1.000	-0.36 ± 1.2	0.991
Optimism	15.8 ± 2.0	15.7 ± 1.5	14.5 ± 1.9	13.9 ± 2.7	0.15 ± 1.3	1.000	0.61 ± 0.75	0.848	1.2± 0.66	0.217	1.8 ± 1.4	0.575
Alexithymia	14.7 ± 2.3	14.7 ± 5.5	16.0 ± 2.5	14.4 ± 3.4	0.1 ± 1.8	1.000	1.5 ± 1.0	0.441	-1.2 ± 1.0	0.577	0.3 ± 1.9	0.999
Difficulty Identifying Feelings	4.7 ± 1.2	4.7 ± 1.5	4.0 ± 1.2	4.8 ± 2.0	0.0 ± 0.9	1.000	-0.8 ± 0.5	0.416	0.7 ± 0.5	0.452	-0.1 ± 0.9	0.416
Difficulty Describing Feelings	4.5 ± 1.0	5.0 ± 3.0	4.7 ± 1.8	4.2 ± 1.6	-0.5 ± 1.0	0.969	0.6 ± 0.6	0.757	-0.2 ± 0.5	0.981	0.8 ± 1.1	0.857
Externally Orientated Feelings	5.5 ± 1.6	5.0 ± 1.0	6.2 ± 1.3	5.8 ± 1.6	0.5 ± 0.9	0.939	0.4 ± 0.5	0.882	-0.7 ± 0.5	0.502	-0.8 ± 0.9	0.815
Perfectionistic Concerns	13.2 ± 2.9	12.7 ± 2.9	13.2 ± 2.8	13.1 ± 0.09	0.52 ± 1.7	0.990	0.13 ± 0.96	0.999	-0.03 ± 0.85	1.000	-0.42 ± 1.8	0.995
Perfectionistic Striving	7.4 ± 1.2	6.0 ± 1.0	6.4 ± 1.2	6.3 ± 0.79	1.4 ± 0.73	0.208	0.10 ± 0.41	0.995	1.1 ± 0.36	**0.025****	-0.27 ± 0.75	0.983
Self-Esteem	13.8 ± 2.5	11.7 ± 2.1	14.2 ± 2.0	14.1 ± 1.8	2.1 ± 1.4	0.784	0.09 ± 0.77	1.000	-0.44 ± 0.68	1.000	-2.4 ± 1.4	0.542
Extraversion	9.1 ± 1.9	11.5 ± 1.7	9.0 ± 2.3	8.9 ± 2.0	-2.4 ± 1.1	0.182	0.62 ± 0.72	0.823	0.19 ± 0.69	0.993	3.2 ± 1.2	**0.044****
Agreeableness	8.6 ± 1.3	9.3 ± 1.5	9.3 ± 1.9	9.0 ± 1.7	-0.77 ± 1.1	0.886	0.30 ± 0.60	0.961	-0.73 ± 0.53	0.516	0.33 ± 1.1	0.990
Conscientiousness	9.4 ± 2.7	10.7 ± 4.0	8.3 ± 2.7	8.2 ± 2.2	-1.3 ± 1.7	0.868	0.15 ± 0.96	0.999	1.0 ± 0.84	0.607	2.5 ± 1.7	0.488
Emotional Stability	8.4 ± 2.7	12.3 ± 0.96	9.1 ± 2.1	9.9 ± 2.4	-3.8 ± 1.3	**0.023****	-0.83 ± 0.81	0.733	-0.66 ± 0.77	0.826	2.3 ± 1.3	0.292
Openness	9.6 ± 2.0	11.0 ± 2.0	9.4 ± 1.8	10.0 ± 2.5	-1.4 ± 1.3	0.705	-0.58 ± 0.73	0.858	0.20 ± 0.64	0.989	1.0 ± 1.3	0.873
Amotivation	3.5 ± 1.5	3.5 ± 0.71	3.5 ± 0.93	3.0 ± 1.5	0.00 ± 1.0	1.000	0.45 ± 0.62	0.882	0.05 ± 0.59	1.000	0.50 ± 1.0	0.961
External Regulation	2.9 ± 1.4	3.0 ± 1.4	3.8 ± 2.3	2.9 ± 1.5	-0.13 ± 1.5	1.000	0.14 ± 1.5	0.705	-0.94 ± 0.86	0.692	0.14 ± 1.5	1.000
Introjected Regulation	4.3 ± 2.5	3.0 ± 1.4	4.1 ± 2.9	4.3 ± 2.4	1.3 ± 2.1	0.929	-0.19 ± 1.3	0.999	0.16 ± 1.2	0.999	-1.3 ± 2.1	0.927
Identified Regulation	12.0 ± 1.5	12.5 ± 0.71	11.5 ± 2.0	10.1 ± 3.9	-0.50 ± 2.0	0.994	1.4 ± 1.2	0.647	0.45 ± 1.1	0.978	2.4 ± 2.0	0.638
Integrated Regulation	11.4 ± 2.4	10.5 ± 0.71	11.6 ± 1.8	9.3 ± 3.1	0.88 ± 1.9	0.965	2.4 ± 1.1	0.916	-0.26 ± 1.1	0.995	1.2 ± 1.9	0.916
IM-General	12.9 ± 0.64	14.0 ± 0.00	13.0 ± 0.89	12.9 ± 0.90	-1.1 ± 0.64	0.318	0.14 ± 0.39	0.983	-0.13 ± 0.38	0.987	1.1 ± 0.65	0.316
Resilience	21.8 ± 2.5	21.0 ± 0.00	21.8 ± 2.8	21.9 ± 3.5	0.75 ± 0.23	0.987	-0.04 ± 1.4	1.000	-0.07 ± 1.3	1.000	-0.86 ± 2.3	0.982
Emotional Intelligence	47.9 ± 3.9	44.0 ± 2.8	46.8 ± 4.4	43.0 ± 4.5	3.9 ± 3.3	0.657	3.8 ± 2.0	0.268	1.1 ± 2.0	0.949	1.0 ± 3.4	0.268
Appraisal of Own Emotions	8.0 ± 0.5	8.0 ± 0.0	7.2 ± 1.5	7.4 ± 1.1	0.0 ± 0.9	1.000	-0.2 ± 0.6	0.972	0.8 ± 0.5	0.457	0.6 ± 1.0	0.930
Appraisal of Others Emotions	7.8 ± 1.2	7.0 ± 1.4	8.0 ± 0.9	7.4 ± 1.4	0.8 ± 0.9	0.839	0.6 ± 0.6	0.730	-0.3 ± 0.5	0.965	-0.4 ± 0.9	0.965
Regulation of Own Emotions	8.4 ± 0.7	7.0 ± 0.0	8.3 ± 0.8	7.4 ± 1.1	1.4 ± 0.7	0.208	0.8 ± 0.4	0.206	0.1 ± 0.4	0.994	-0.4 ± 0.7	0.924
Regulation of Others Emotions	7.5 ± 1.4	7.0 ± 0.0	7.6 ± 1.4	7.3 ± 1.1	0.5 ± 1.0	0.963	0.4 ± 0.6	0.946	-0.1 ± 0.6	0.996	0.4 ± 0.6	0.993
Utilisation of Emotions	8.5 ± 0.9	8.0 ± 0.0	8.0 ± 0.9	7.6 ± 1.1	0.5 ± 0.8	0.909	0.4 ± 0.5	0.788	0.5 ± 0.8	0.674	0.4 ± 0.8	0.942
Coping Strategies	27.0 ± 4.1	25.5 ± 4.9	27.8 ± 4.2	24.0 ± 7.0	1.5 ± 3.9	0.981	3.8 ± 2.7	0.504	-0.80 ± 2.4	0.987	1.5 ± 4.1	0.983
Coping with Adversity	4.7 ± 1.3	3.0 ± 1.4	4.1 ± 0.88	3.8 ± 1.0	1.7 ± 1.1	0.394	0.30 ± 0.73	0.976	0.61 ± 0.65	0.784	-0.80 ± 1.1	0.887
Performing Under Pressure	4.4 ± 1.1	3.0 ± 1.4	4.2 ± 1.4	3.6 ± 1.8	1.4 ± 1.1	0.603	0.60 ± 0.78	0.867	0.23 ± 0.70	0.988	-0.60 ± 1.2	0.957
Mental Preparation	2.7 ± 1.4	2.0 ± 0.00	3.1 ± 1.8	3.0 ± 1.6	0.71 ± 1.3	0.942	0.10 ± 0.87	0.999	-0.39 ± 0.78	0.960	-1.0 ± 1.3	0.874
Concentration	4.3 ± 0.95	3.5 ± 0.71	4.6 ± 0.84	3.8 ± 0.84	0.79 ± 0.70	0.678	0.80 ± 0.48	0.360	-0.31 ± 0.43	0.883	-0.30 ± 0.73	0.976
Free from Worry	2.6 ± 1.3	5.0 ± 1.4	2.9 ± 1.4	2.6 ± 0.89	-2.4 ± 1.0	0.125	0.30 ± 0.71	0.974	-0.33 ± 0.64	0.955	2.4 ± 1.1	0.156
Achievement Motivation	4.0 ± 1.0	4.5 ± 0.71	3.6 ± 1.1	3.2 ± 0.45	-0.50 ± 0.71	0.910	0.40 ± 0.52	0.864	0.40 ± 0.46	0.824	1.3 ± 0.79	0.374
Coachability	4.3 ± 0.95	4.5 ± 0.71	5.3 ± 1.1	4.0 ± 1.2	-0.21 ± 0.84	0.994	1.3 ± 0.57	0.141	-1.3 ± 0.52	0.236	0.50 ± 0.88	0.940

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation Sig. = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 16: Birthdate distribution effect on psychological differences (Mean ± Standard Deviation) in Under 16s Backs Rugby Union

Under 16s Backs	Regional H1	Regional H2	Club H1	Club H2	Regional (H1 vs H2)	*P*	Club (H1 vs H2)	*P*	Regional Vs Club (H1 vs H1)	*P*	Regional Vs Club (H2 vs H2)	*P*
Outcome Focus	8.7 ± 1.2	8.6 ± 1.5	8.4 ± 1.3	8.5 ± 1.3	0.11 ± 0.45	0.995	-0.12 ± 0.48	0.995	0.30 ± 0.46	0.915	0.07 ± 0.47	0.999
Mastery Focus	9.2 ± 0.91	9.2 ± 0.97	8.9 ± 1.0	9.3 ± 0.91	-0.03 ± 0.32	1.000	-0.41 ± 0.35	0.636	0.26 ± 0.33	0.863	-0.12 ± 0.34	0.985
Commitment	8.7 ± 1.0	8.5 ± 1.3	8.2 ± 1.2	8.4 ± 1.3	0.18 ± 0.41	0.970	-0.16 ± 0.43	0.983	0.45 ± 0.42	0.700	0.11 ± 0.42	0.994
Athlete Burnout	28.6 ± 4.8	28.1 ± 4.1	30.1 ± 7.7	29.8 ± 7.3	0.56 ± 2.1	0.993	0.33 ± 2.2	0.999	-1.4 ± 2.1	0.902	-1.7 ± 2.2	0.871
Exhaustion	9.0 ± 2.7	9.5 ± 2.3	9.8 ± 3.0	10.4 ± 4.2	-0.50 ± 1.1	0.966	-0.61 ± 1.2	0.954	-0.77 ± 1.1	0.895	-0.88 ± 1.1	0.869
RS. Accomplishment	11.7 ± 3.1	11.3 ± 3.1	11.9 ± 3.4	11.6 ± 3.1	0.44 ± 1.1	0.976	0.30 ± 1.2	0.994	-0.20 ± 1.1	0.998	-0.34 ± 1.1	0.991
Sport Devaluation	7.9 ± 2.1	7.3 ± 2.0	8.4 ± 2.5	7.8 ± 2.3	0.62 ± 0.76	0.846	0.63 ± 0.83	0.871	-0.48 ± 0.78	0.928	-0.46 ± 0.82	0.941
Life Stress	6.6 ± 3.0	6.5 ± 1.3	6.8 ± 1.8	6.2 ± 2.1	0.1 ± 0.8	1.000	0.6 ± 0.8	0.874	-0.3 ± 0.8	0.988	0.3 ± 0.8	0.981
Training stress	6.5 ± 2.5	6.5 ± 0.9	6.5 ± 2.2	6.5 ± 2.2	0.1 ± 0.8	1.000	0.4 ± 0.8	0.951	-0.4 ± 0.8	0.961	-0.0 ± 0.8	1.000
Athlete Identity	7.1 ± 1.6	6.6 ± 2.1	6.3 ± 1.8	6.3 ± 1.9	0.49 ± 0.63	0.859	0.03 ± 0.67	1.000	0.93 ± 0.64	0.568	0.37 ± 0.65	0.943
Optimism	15.2 ± 1.5	14.8 ± 2.9	14.7 ± 2.0	14.2 ± 1.8	0.44 ± 0.70	0.922	0.47 ± 0.75	0.922	0.54 ± 0.72	0.878	0.56 ± 0.73	0.867
Alexithymia	14.9 ± 3.5	14.3 ± 3.1	14.2 ± 1.3	14.6 ± 3.2	0.6 ± 1.1	0.951	-0.4 ± 1.2	0.988	0.7 ± 1.1	0.931	-0.3 ± 1.2	0.994
Difficulty Identifying Feelings	4.8 ± 1.7	4.5 ± 1.4	4.6 ± 1.4	4.2 ± 1.4	0.3 ± 0.5	0.949	0.0 ± 0.5	1.000	0.6 ± 0.5	0.670	0.3 ± 0.5	0.936
Difficulty Describing Feelings	4.8 ± 2.1	4.2 ± 1.8	4.6 ± 1.4	4.3 ± 1.6	0.5 ± 0.6	0.816	0.3 ± 0.6	0.953	0.2 ± 0.6	0.994	-0.0 ± 0.6	1.000
Externally Orientated Feelings	5.3 ± 1.4	5.2 ± 1.2	5.8 ± 1.6	5.9 ± 1.7	0.1 ± 0.5	0.998	-0.0 ± 0.6	1.000	-0.5 ± 0.5	0.753	-0.7 ± 0.6	0.634
Perfectionistic Concerns	14.2 ± 3.5	12.6 ± 2.5	11.6 ± 2.4	13.2 ± 3.3	1.6 ± 1.0	0.432	-1.6 ± 1.1	0.474	2.6 ± 1.1	0.078	-0.58 ± 1.1	0.951
Perfectionistic Striving	7.5 ± 0.96	6.6 ± 1.2	6.8 ± 1.2	6.5 ± 1.4	0.90 ± 0.41	0.135	0.35 ± 0.44	0.858	0.70 ± 0.42	0.351	0.14 ± 0.43	0.987
Self-Esteem	15.0 ± 2.3	13.0 ± 2.2	12.9 ± 1.3	13.8 ± 2.1	2.1 ± 0.71	**0.027****	-0.91 ± 0.75	0.625	2.1 ± 0.73	**0.024****	-0.83 ± 0.74	0.673
Extraversion	8.4 ± 2.0	9.0 ± 1.6	9.2 ± 1.7	9.7 ± 1.9	-0.64 ± 0.64	0.752	-0.57 ± 0.66	0.827	-0.79 ± 0.64	0.605	-0.72 ± 0.66	0.698
Agreeableness	9.3 ± 2.0	8.3 ± 2.2	9.0 ± 2.3	8.3 ± 1.8	1.0 ± 0.69	0.451	0.67 ± 0.74	0.804	0.32 ± 0.71	0.970	-0.05 ± 0.72	1.000
Conscientiousness	8.3 ± 2.3	10.8 ± 2.1	9.4 ± 2.7	9.5 ± 1.9	-2.5 ± 0.79	**0.012****	-0.04 ± 0.82	1.000	-1.2 ± 0.79	0.438	1.3 ± 0.82	0.415
Emotional Stability	9.6 ± 2.2	9.1 ± 2.7	9.7 ± 2.9	9.5 ± 2.0	0.47 ± 0.85	0.944	0.14 ± 0.90	0.999	-0.15 ± 0.87	0.998	-0.48 ± 0.88	0.947
Openness	10.3 ± 2.4	9.6 ± 2.4	10.2 ± 2.2	10.3 ± 2.2	0.68 ± 0.79	0.830	-0.12 ± 0.85	0.999	0.16 ± 0.81	0.997	-0.63 ± 0.83	0.869
Amotivation	3.5 ± 1.7	2.3 ± 0.52	3.7 ± 2.6	3.2 ± 1.7	1.1 ± 0.88	0.580	0.51 ± 0.88	0.936	-0.25 ± 0.84	0.990	-0.88 ± 0.92	0.783
External Regulation	3.6 ± 1.7	3.0 ± 1.5	3.3 ± 1.5	3.3 ± 2.3	0.62 ± 0.91	0.905	-0.01 ± 0.91	1.000	0.33 ± 0.86	0.981	-0.30 ± 0.95	0.989
Introjected Regulation	3.8 ± 1.7	2.8 ± 1.2	3.1 ± 0.90	6.1 ± 3.9	1.0 ± 1.2	0.825	-3.0 ± 1.2	0.077	0.70 ± 1.1	0.922	-3.3 ± 1.2	0.057
Identified Regulation	11.5 ± 1.8	9.8 ± 2.9	10.7 ± 3.0	12.0 ± 1.8	1.7 ± 1.1	0.428	-1.3 ± 1.1	0.655	0.82 ± 1.1	0.862	-2.2 ± 1.2	0.262
Integrated Regulation	11.4 ± 2.0	10.0 ± 2.6	11.0 ± 2.6	11.5 ± 2.1	1.4 ± 1.1	0.600	-0.50 ± 1.1	0.969	0.38 ± 1.1	0.983	-1.5 ± 1.1	0.579
IM-General	12.7 ± 1.4	12.7 ± 1.0	12.1 ± 4.1	13.0 ± 1.9	0.02 ± 1.1	1.000	-0.86 ± 1.1	0.867	0.55 ± 1.1	0.954	-0.86 ± 1.1	0.992
Resilience	21.9 ± 3.0	21.5 ± 2.0	22.9 ± 1.9	22.4 ± 3.9	0.42 ± 1.5	0.992	0.46 ± 1.3	0.989	-0.93 ± 1.4	0.909	-0.90 ± 1.5	0.936
Emotional Intelligence	45.3 ± 4.9	47.7 ± 3.0	46.9 ± 4.5	45.4 ± 4.2	--2.4 ± 2.2	0.698	1.5 ± 2.2	0.906	-1.5 ± 2.1	0.874	2.3 ± 2.3	0.750
Appraisal of Own Emotions	7.3 ± 1.4	8.0 ± 0.6	7.2 ± 2.4	7.2 ± 2.4	-0.7 ± 0.8	0.813	0.8 ± 0.8	0.737	-0.7 ± 0.7	0.788	0.8 ± 0.8	0.763
Appraisal of Others Emotions	7.4 ± 1.3	8.2 ± 1.0	8.1 ± 0.9	6.7 ± 0.9	-0.8 ± 0.5	0.486	1.4 ± 0.5	0.056	-0.8 ± 0.5	0.468	1.5 ± 0.6	0.067
Regulation of Own Emotions	7.8 ± 0.8	7.8 ± 1.7	8.4 ± 1.3	8.4 ± 1.3	0.0 ± 0.6	1.000	0.0 ± 0.6	1.000	-0.6 ± 0.6	0.734	-0.6 ± 0.6	0.800
Regulation of Others Emotions	7.1 ± 1.3	7.3 ± 1.4	7.1 ± 1.6	7.4 ± 0.7	-0.3 ± 0.6	0.975	-0.3 ±0.6	0.975	-0.1 ± 0.6	0.999	-0.1 ±0.6	1.000
Utilisation of Emotions	8.4 ± 1.2	8.3 ± 0.5	7.9 ± 0.7	8.4 ± 1.2	0.1 ± 0.5	1.000	-0.5 ± 0.5	0.708	0.5 ± 0.5	0.694	-0.1 ± 0.5	0.999
Coping Strategies	27.8 ± 5.2	29.8 ± 6.3	25.0 ± 3.8	26.3 ± 6.1	-2.1 ± 2.7	0.868	-1.3 ± 2.9	0.974	2.8 ± 2.7	0.732	3.6 ± 2.9	0.619
Coping with Adversity	3.9 ± 1.1	4.2 ± 1.2	3.2 ± 0.75	3.6 ± 1.5	-0.24 ± 0.58	0.975	-0.45 ± 0.64	0.889	0.76 ± 0.58	0.572	0.54 ± 0.64	0.831
Performing Under Pressure	3.8 ± 1.4	3.8 ± 1.2	3.8 ± 1.2	3.8 ± 1.3	0.01 ± 0.67	1.000	-0.58 ± 0.73	0.854	0.68 ± 0.67	0.739	0.08 ± 0.73	0.999
Mental Preparation	4.1 ± 1.4	3.3 ± 1.5	3.0 ± 1.5	3.3 ± 1.5	0.74 ± 0.72	0.732	-0.25 ± 0.79	0.989	1.1 ± 0.72	0.453	0.08 ± 0.79	1.000
Concentration	4.5 ± 0.88	5.0 ± 1.3	3.7 ± 0.82	4.0 ± 1.1	-0.54 ± 0.49	0.693	-0.33 ± 0.54	0.924	0.79 ± 0.49	0.382	1.0 ± 0.54	0.265
Free from Worry	2.5 ± 0.88	3.7 ± 2.3	3.7 ± 1.9	3.4 ± 1.6	-1.2 ± 0.77	0.409	0.29 ± 0.84	0.985	-1.2 ± 0.77	0.409	0.29 ± 0.84	0.985
Achievement Motivation	3.8 ± 1.3	4.5 ± 1.0	3.3 ± 1.2	3.9 ± 1.3	-0.65 ± 0.63	0.730	-0.54 ± 0.69	0.861	0.51 ± 0.63	0.848	0.63 ± 0.69	0.802
Coachability	5.2 ± 1.2	5.3 ± 1.0	5.0 ± 0.89	4.4 ± 1.2	-0.18 ± 0.56	0.988	0.63 ± 0.61	0.736	0.15 ± 0.56	0.992	0.96 ± 0.61	0.409

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 17: Birthdate distribution effect on psychological differences (Mean ± Standard Deviation) in Under 18s Backs Rugby Union

Under 18s Backs	Regional H1	Regional H2	Club H1	Club H2	Regional (H1 vs H2)	*P*	Club (H1 vs H2)	*P*	Regional Vs Club (H1 vs H1)	*P*	Regional Vs Club (H2 vs H2)	*P*
Outcome Focus	8.1 ± 1.2	8.6 ± 1.0	8.3 ± 1.5	7.8 ± 2.1	0.5 ± 0.6	0.841	0.58 ± 0.66	0.815	-0.22 ± 0.71	0.989	0.89 ± 0.59	0.441
Mastery Focus	8.7 ± 1.0	9.3 ± 1.0	9.1 ± 0.9	8.4 ± 1.6	-0.6 ± 0.5	0.620	0.69 ± 0.52	0.554	-0.44 ± 0.56	0.858	0.87 ± 0.47	0.263
Commitment	7.7 ± 1.6	7.8 ± 1.4	7.9 ± 1.1	7.6 ± 1.2	-0.0 ± 0.6	1.000	0.31 ± 0.59	0.954	-0.11 ± 0.63	0.998	0.20 ± 0.53	0.980
Athlete Burnout	34.0 ± 7.8	29.7 ± 6.7	32.2 ± 6.1	34.8 ± 8.7	4.3 ± 3.2	0.536	-2.4 ± 3.3	0.877	1.8 ± 3.5	0.957	-5.0 ± 2.9	0.338
Exhaustion	11.2 ± 3.2	9.4 ± 2.7	9.7 ± 2.6	11.8 ± 4.3	1.9 ± 1.4	0.551	-2.2 ± 1.5	0.450	1.6 ± 1.6	0.748	-2.5 ± 1.3	0.238
RS. Accomplishment	13.7 ± 3.0	13.0 ± 2.8	13.6 ± 1.9	12.6 ± 3.2	0.7 ± 1.2	0.944	0.97 ± 1.2	0.861	0.11 ± 1.2	1.000	0.42 ± 1.1	0.981
Sport Devaluation	9.1 ± 3.3	7.4 ± 2.0	9.0 ± 3.2	10.3 ± 3.5	1.8 ± 1.3	0.529	-1.3 ± 1.3	0.783	0.11 ± 1.4	1.000	-2.9 ± 1.2	0.085
Life Stress	6.8 ± 2.1	7.1 ± 1.5	7.3 ± 2.2	7.5 ± 2.7	-0.3 ± 0.9	0.986	-0.3 ± 1.0	0.990	-0.5 ± 1.1	0.965	-0.5 ± 0.8	0.941
Training stress	7.6 ± 1.8	7.1 ± 1.3	6.9 ±2.5	7.2 ± 2.6	0.6 ±0.9	0.929	-0.4 ± 0.9	0.980	0.8 ± 1.0	0.884	-0.2 ± 0.8	0.997
Athlete Identity	5.4 ± 2.2	5.5 ± 2.0	6.7 ± 1.4	6.8 ± 1.6	-0.2 ± 0.8	0.997	-0.17 ± 0.80	0.997	-1.3 ± 0.88	0.467	-1.3 ± 0.73	0.296
Optimism	13.6 ± 2.1	13.6 ± 2.8	13.8 ± 2.9	13.3 ± 2.6	0.0 ± 1.2	1.000	0.53 ± 1.2	0.970	-0.15 ± 1.3	0.999	0.37 ± 1.1	0.986
Alexithymia	11.9 ±5.2	13.4 ± 2.8	16.3 ± 4.0	15.8 ± 3.1	-1.5 ± 0.8	0.795	0.4 ± 1.6	0.995	-4.4 ± 1.8	0.093	-2.5 ± 1.4	0.301
Difficulty Identifying Feelings	3.0 ±2.3	3.6 ±1.8	4.9 ± 1.0	4.7 ±1.4	-0.6 ± 0.7	0.130	0.2 ± 0.8	0.995	-1.9 ± 0.8	0.130	-1.1 ± 0.6	0.317
Difficulty Describing Feelings	3.4 ± 2.8	3.4 ± 1.9	6.0 ± 2.4	5.4 ±2.2	-0.1 ± 1.0	0.109	0.6 ± 1.0	0.929	-2.6 ± 1.1	0.109	-2.0 ± 0.9	0.127
Externally Orientated Feelings	4.9 ± 3.2	5.7 ± 2.5	5.4 ± 1.6	5.8 ± 1.8	-0.8 ± 1.0	0.848	-0.4 ± 1.0	0.982	-0.5 ± 1.2	0.973	-0.1 ± 0.9	1.000
Perfectionistic Concerns	13.3 ± 2.9	13.9 ± 3.1	14.1 ± 2.3	12.6 ± 2.1	-0.7 ± 1.2	0.941	1.5 ± 1.2	0.560	-0.86 ± 1.3	0.907	1.3 ± 1.1	0.588
Perfectionistic Striving	6.9 ± 1.1	6.4 ± 1.7	6.8 ± 0.9	6.3 ± 1.6	0.5 ± 0.7	0.875	0.53 ± 0.64	0.842	0.10 ± 0.70	0.999	0.13 ± 0.58	0.842
Self-Esteem	14.0 ± 1.6	13.1 ± 3.1	13.6 ± 1.7	13.7 ± 2.3	0.9 ± 1.1	0.826	-0.11 ± 1.1	1.000	0.44 ± 1.2	0.981	-0.59 ± 0.96	0.927
Extraversion	10.0 ± 2.1	8.9 ± 1.7	8.7 ± 1.2	9.1 ± 1.8	1.1 ± 0.8	0.516	-0.42 ± 0.76	0.947	1.3 ± 0.84	0.399	-0.16 ± 0.69	0.996
Agreeableness	9.1 ± 1.4	8.7 ± 1.6	8.9 ± 1.5	10.2 ± 2.2	0.4 ± 0.8	0.944	-1.3 ± 0.76	0.352	0.24 ± 0.84	0.992	-1.5 ± 0.69	0.164
Conscientiousness	10.0 ± 3.2	9.5 ± 2.1	8.3 ± 1.7	10.2 ± 2.6	0.5 ± 1.1	0.959	-1.8 ± 1.1	0.325	1.7 ± 1.2	0.493	-0.71 ± 0.97	0.884
Emotional Stability	9.3 ± 2.4	9.2 ± 2.6	8.6 ± 1.7	8.9 ± 2.2	0.0 ± 1.0	1.000	-0.36 ± 0.99	0.983	0.69 ± 1.1	0.920	0.31 ± 0.90	0.985
Openness	9.8 ± 2.3	9.7 ± 1.9	9.2 ± 1.6	8.9 ± 2.0	0.1 ± 0.9	1.000	0.31 ± 0.85	0.984	0.53 ± 0.94	0.943	0.78 ± 0.78	0.750
Amotivation	2.3 ± 0.6	2.9 ± 1.6	2.0 ± 0.0	3.6 ± 1.5	-0.5 ± 1.0	0.945	-1.6 ± 1.2	0.529	0.33 ± 1.3	0.993	-0.74 ± 0.81	0.795
External Regulation	2.3 ± 0.6	3.6 ± 2.6	3.5 ± 2.1	2.8 ± 1.3	-1.2 ± 1.4	0.814	0.70 ± 1.7	0.975	-1.2 ± 1.9	0.921	0.77 ± 1.2	0.914
Introjected Regulation	2.3 ± 0.6	4.0 ± 2.6	4.0 ± 2.8	4.0 ± 2.9	-1.7 ± 1.8	0.781	0.00 ± 1.5	1.000	-1.7 ± 2.3	0.889	0.00 ± 1.5	1.000
Identified Regulation	9.0 ± 3.0	9.6 ± 4.2	12.5 ± 0.71	10.4 ± 3.1	-0.6 ± 2.4	0.995	2.1 ± 2.9	0.890	-3.5 ± 3.2	0.703	-0.83 ± 2.1	0.977
Integrated Regulation	9.0 ± 2.6	8.9 ± 2.8	12.5 ± 0.71	11.8 ± 1.5	0.1 ± 1.6	1.000	0.70 ± 1.9	0.983	-3.5 ± 2.1	0.387	-2.9 ± 1.4	0.185
IM-General	10.7 ± 1.5	12.4 ± 1.8	14.0 ± 0.0	12.6 ± 1.3	-1.8 ± 1.1	0.393	1.4 ± 1.3	0.711	-3.3 ± 1.4	0.139	-0.17 ± 0.91	0.998
Resilience	22.3 ± 3.1	24.1 ± 4.4	22.0 ± 2.8	19.6 ± 4.5	-1.8 ± 2.9	0.919	2.4 ± 3.5	0.898	0.33 ± 3.8	1.000	4.5 ± 2.4	0.285
Emotional Intelligence	44.7 ± 3.1	45.3 ± 8.1	45.5 ± 6.4	40.5 ± 5.1	-0.6 ± 4.4	0.999	5.0 ± 5.3	0.778	-0.8 ± 5.9	0.999	4.8 ± 3.6	0.778
Appraisal of Own Emotions	6.0 ± 1.0	8.3 ± 1.3	7.0 ± 1.4	6.7 ± 1.2	-2.3 ± 0.8	0.070	0.3 ± 1.0	0.986	-1.0 ± 1.1	0.805	1.6 ± 0.7	0.986
Appraisal of Others Emotions	7.7 ± 1.5	8.0 ± 1.5	8.0 ± 2.8	7.5 ± 1.9	-0.3 ± 1.2	0.993	0.5 ± 1.0	0.985	-0.3 ± 1.6	0.997	0.5 ± 1.0	0.956
Regulation of Own Emotions	8.0 ± 1.0	7.4 ± 1.8	7.5 ± 1.9	7.0 ± 1.4	0.6 ± 1.0	0.945	0.0 ± 1.2	1.000	1.0 ± 1.4	0.884	0.4 ± 0.8	0.955
Regulation of Others Emotions	8.0 ±1.0	6.4 ± 1.5	7.0 ± 1.4	7.2 ± 2.0	1.6 ± 1.1	0.520	0.3 ± 1.3	0.994	0.5 ± 1.5	0.986	-0.7 ± 0.9	0.846
Utilisation of Emotions	8.0 ± 1.0	7.3 ± 1.7	7.5 ± 0.7	6.0 ± 1.3	0.7 ± 1.0	0.880	2.0 ± 1.1	0.336	0.0 ± 1.3	1.000	1.3 ± 0.8	0.384
Coping Strategies	28.0 ± 1.0	24.6 ± 3.8		27.5 ± 4.2	3.4 ± 2.6	0.426					0.50 ± 2.7	0.982
Coping with Adversity	4.3 ± 0.6	3.2 ± 1.3		3.5 ± 1.3	1.1 ± 0.9	0.421					0.83 ± 0.90	0.638
Performing Under Pressure	4.3 ± 1.2	3.8 ± 1.3		4.0 ± 0.8	0.5 ± 0.8	0.799					0.33 ± 0.86	0.922
Mental Preparation	3.0 ± 1.0	2.8 ± 1.9	NO DATA	2.5 ± 0.6	0.2 ± 1.0	0.979	NO DATA		NO DATA		0.50 ± 1.1	0.889
Concentration	4.0 ± 1.0	3.8 ± 0.8		4.5 ± 0.6	0.2 ± 0.6	0.938					-0.50 ± 0.61	0.703
Free from Worry	2.0 ± 1.7	2.8 ± 0.8		4.3 ± 0.5	-0.8 ± 0.8	0.558					-2.3 ± 0.79	**0.045****
Achievement Motivation	4.3 ± 0.6	3.0 ± 1.0		3.6 ± 1.1	1.5 ± 0.7	0.229					0.58 ± 0.78	0.743
Coachability	6.0 ± 0.0	5.2 ± 0.8		5.0 ± 1.2	0.8 ± 0.6	0.450					1.0 ± 0.66	0.333

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 18: Birthdate distribution effect on psychological differences (Mean ± Standard Deviation) in Elite Under 18s Backs Rugby Union

Elite Under 18s Backs	Regional H1	Regional H2	Club H1	Club H2	Regional (H1 vs H2)	*P*	Club (H1 vs H2)	*P*	Regional Vs Club (H1 vs H1)	*P*	Regional Vs Club (H2 vs H2)	*P*
Outcome Focus	8.2 ± 1.8	8.7 ± 1.6	8.6 ± 1.4	7.9 ± 1.5	-0.5 ± 0.9	0.943	0.7 ± 0.5	0.519	-0.4 ± 0.9	0.939	0.7 ± 0.7	0.715
Mastery Focus	8.3 ± 1.4	8.8 ± 1.2	9.1 ± 1.0	8.8 ± 1.4	-0.5 ± 0.7	0.896	0.3 ± 0.4	0.852	-0.8 ± 0.6	0.545	0.0 ± 0.6	1.000
Commitment	7.0 ± 1.4	8.7 ± 0.5	7.9 ± 1.3	7.7 ± 1.0	-1.7 ± 0.6	**0.042****	0.3 ± 0.3	0.840	-0.9 ± 0.5	0.315	1.0 ± 0.5	0.119
Athlete Burnout	37.4 ± 4.4	27.0 ± 5.6	32.5 ± 6.0	33.3 ± 7.7	10.4 ± 4.0	**0.050****	-0.7 ± 2.1	0.986	4.8 ± 3.3	0.607	-6.3 ± 2.9	0.137
Exhaustion	12.5 ± 2.4	13.7 ± 2.7	10.5 ± 3.4	10.3 ± 3.3	-1.2 ± 1.9	0.922	0.1 ± 1.0	0.999	2.0 ± 1.5	0.549	3.3 ± 1.5	0.116
RS. Accomplishment	14.4 ± 2.1	10.1 ± 1.9	13.6 ± 2.2	12.5 ± 3.1	4.3 ± 1.5	**0.033****	1.2 ± 0.8	0.402	0.8 ± 1.3	0.929	-2.3 ± 1.1	0.168
Sport Devaluation	11.5 ± 2.9	8.7 ± 2.0	8.6 ± 2.4	8.8 ± 3.3	2.8 ± 1.7	0.340	-0.2 ± 0.9	0.998	2.9 ± 1.4	0.178	-0.1 ± 1.3	1.000
Life Stress	9.2 ± 3.9	8.0 ± 1.4	7.0 ± 2.1	7.3 ± 2.1	1.2 ± 1.3	0.813	-0.3 ± 0.7	0.976	2.2 ± 1.1	0.209	0.7 ± 1.0	0.903
Training stress	10.0 ± 3.3	8.3 ± 1.5	7.3 ± 2.1	7.1 ± 2.0	1.7 ± 1.2	0.537	0.1 ± 0.7	0.999	2.8 ± 1.0	**0.047****	1.2 ± 1.0	0.613
Athlete Identity	6.0 ± 2.5	5.3 ± 2.0	6.3 ± 2.0	6.2 ± 1.8	0.7 ± 1.1	0.936	0.2 ± 0.6	0.995	-0.3 ± 0.9	0.987	-0.8 ± 0.9	0.793
Optimism	14.0 ± 3.2	14.2 ± 2.0	13.8 ± 2.5	13.4 ± 2.6	-0.2 ± 1.5	1.000	0.4 ± 0.8	0.975	.25 ± 1.2	0.997	0.8 ± 0.1	0.916
Alexithymia	16.0 ± 2.9	15.7 ± 1.9	14.1 ± 5.0	14.6 ± 3.2	0.3 ± 2.1	0.999	-0.5 ± 1.2	0.974	1.9 ± 1.8	0.693	1.1 ± 1.7	0.909
Difficulty Identifying Feelings	4.5 ± 1.6	4.5 ± 1.4	3.9 ± 2.0	4.1 ± 1.7	0.0 ± 2.0	1.000	-0.2 ± 0.5	0.989	0.6 ± 0.8	0.906	0.4 ± 0.8	0.960
Difficulty Describing Feelings	5.2 ± 2.0	5.2 ± 1.6	4.7 ± 2.8	4.4 ± 2.2	0.0 ± 1.4	1.000	0.3 ± 0.7	0.974	0.5 ± 1.1	0.974	0.8 ± 1.1	0.878
Externally Orientated Feelings	6.3 ± 2.1	6.0 ± 0.6	5.1 ± 2.5	5.7 ± 2.2	0.3 ± 1.2	0.993	-0.6 ± 0.7	0.801	1.2 ± 1.0	0.647	0.3 ± 1.0	0.993
Perfectionistic Concerns	13.7 ± 3.8	15.7 ± 0.8	13.4 ± 2.6	13.5 ± 2.6	-2.0 ± 1.5	0.564	-0.2 ± 1.2	0.998	-0.3 ± 1.3	0.996	2.1 ± 1.2	0.295
Perfectionistic Striving	6.7 ± 1.5	7.3 ± 0.8	6.8 ± 1.0	6.2 ± 1.6	-0.7 ± 0.8	0.836	0.6 ± 0.4	0.513	-0.2 ± 0.7	0.996	1.1 ± 0.6	0.282
Self-Esteem	13.2 ± 4.2	14.5 ± 1.2	13.8 ± 1.7	13.0 ± 2.7	-1.3 ± 1.5	0.802	0.8 ± 0.8	0.753	-0.7 ± 1.2	0.952	1.5 ± 1.2	0.571
Extraversion	7.3 ± 0.8	10.3 ± 1.3	9.1 ± 1.5	9.2 ± 2.2	-3.0 ± 1.0	**0.019****	-0.1 ± 0.6	0.998	-1.7 ± 0.8	0.172	1.1 ± 0.8	0.439
Agreeableness	7.5 ± 1.5	8.4 ± 1.7	9.0 ± 1.5	9.6 ± 2.8	-0.9 ± 1.1	0.819	-0.6 ± 0.6	0.713	-1.5 ± 0.9	0.361	-1.2 ± 0.8	0.457
Conscientiousness	7.7 ± 1.5	10.4 ± 2.1	8.1 ± 2.1	9.4 ± 2.5	-2.8 ± 1.3	0.180	-1.5 ± 0.8	0.208	-0.4 ± 1.1	0.986	0.9 ± 1.0	0.834
Emotional Stability	8.2 ± 1.6	11.1 ± 2.0	8.1 ± 1.5	9.6 ± 2.1	-3.0 ± 1.2	0.066	-1.3 ± 0.7	0.193	0.1 ± 0.1	1.000	1.7 ± 0.9	0.227
Openness	8.0 ± 1.4	11.6 ± 1.0	8.9 ± 1.7	9.6 ± 1.7	-3.6 ± 1.0	**0.005****	0.6 ± 0.6	0.710	-0.9 ± 0.9	0.705	2.0 ± 0.8	0.063
Amotivation	5.3 ± 3.5	2.7 ± 1.2	2.2 ± 0.5	3.2 ± 1.5	2.7 ± 1.4	0.245	-1.0 ± 0.9	0.706	3.1 ± 1.2	0.084	-0.5 ± 1.1	0.967
External Regulation	4.3 ± 2.1	3.3 ± 1.2	2.8 ± 1.3	3.3 ± 2.1	1.0 ± 1.5	0.916	-0.5 ± 1.0	0.970	1.5 ± 1.4	0.690	0.1 ± 1.2	1.000
Introjected Regulation	5.3 ± 3.1	8.7 ± 4.0	3.0 ± 1.7	4.0 ± 2.6	-3.3 ± 2.2	0.453	-1.0 ± 1.4	0.898	2.3 ± 2.0	0.646	4.7 ± 1.7	0.066
Identified Regulation	9.3 ± 1.5	10.3 ± 1.5	10.4 ± 2.9	9.9 ± 2.6	-1.0 ± 2.6	0.979	0.5 ± 1.7	0.991	-1.1 ± 2.3	0.966	0.4 ± 2.0	0.997
Integrated Regulation	10.0 ± 1.0	10.3 ± 0.6	10.4 ± 2.7	10.1 ± 2.7	-0.3 ± 2.0	0.998	0.3 ± 1.3	0.999	-0.4 ± 1.8	0.996	0.3 ± 1.6	0.999
IM-General	12.7 ± 2.3	12.0 ± 2.6	12.0 ± 2.1	12.5 ± 1.6	0.7 ± 1.6	0.973	-0.5 ± 1.0	0.977	0.7 ± 1.4	0.963	-0.5 ± 1.2	0.977
Resilience	18.7 ± 2.5	19.0 ± 4.4	22.2 ± 2.6	22.3 ± 4.8	-0.3 ± 3.4	1.000	-0.1 ± 2.2	1.000	-3.5 ± 3.1	0.662	-3.3 ± 2.7	0.633
Emotional Intelligence	44.7 ± 7.4	39.7 ± 7.5	45.0 ± 3.9	43.1 ± 7.0	5.0 ± 5.4	0.792	1.9 ± 3.5	0.945	-0.3 ± 4.8	1.000	-3.4 ± 4.2	0.852
Appraisal of Own Emotions	6.7 ± 1.2	6.7 ± 1.2	6.4 ± 1.1	7.5 ± 1.5	0.3 ± 1.1	0.991	-1.1 ± 0.7	0.415	0.3 ± 1.0	0.993	-1.2 ± 0.9	0.532
Appraisal of Others Emotions	7.3 ± 1.5	7.3 ± 1.5	7.8 ± 1.8	7.8 ± 1.6	0.0 ± 1.3	1.000	0.0 ± 0.9	1.000	-0.5 ± 1.2	0.979	-0.5 ± 1.0	0.974
Regulation of Own Emotions	8.0 ± 2.0	7.0 ± 1.0	7.6 ± 0.9	7.2 ± 1.6	1.0 ± 1.2	0.839	0.4 ± 0.8	0.964	0.4 ± 1.1	0.982	-0.2 ± 0.9	0.995
Regulation of Others Emotions	7.7 ± 1.2	6.3 ± 1.2	7.8 ± 0.8	6.8 ± 1.7	1.3 ± 1.2	0.696	1.0 ± 0.8	0.565	-0.1 ± 1.2	0.999	-0.4 ± 1.0	0.968
Utilisation of Emotions	7.7 ± 1.5	5.7 ± 2.5	8.0 ± 0.7	6.7 ± 1.6	2.0 ± 1.3	0.429	1.3 ± 0.8	0.417	-0.3 ± 1.2	0.991	-1.0 ± 1.0	0.745
Coping Strategies	26.0 ± 5.2	20.0 ± 4.2	29.3 ± 2.6	25.9 ± 4.0	6.0 ± 3.6	0.387	3.4 ± 2.4	0.278	-3.3 ± 3.1	0.716	-5.9 ± 3.1	0.278
Coping with Adversity	4.3 ± 0.6	3.0 ± 1.4	4.3 ± 0.5	3.3 ± 1.2	1.3 ± 1.0	0.524	0.9 ± 0.6	0.489	0.1 ± 0.8	1.000	-0.3 ± 0.8	0.976
Performing Under Pressure	4.7 ± 1.5	2.0 ± 1.4	4.5 ± 1.0	3.9 ± 1.1	2.7 ± 0.6	0.097	0.6 ± 0.7	0.813	0.2 ± 0.9	0.997	-1.9 ± 0.9	0.201
Mental Preparation	3.7 ± 2.5	2.5 ± 2.1	3.8 ± 1.7	2.7 ± 1.4	1.2 ± 1.6	0.880	1.1 ± 1.0	0.729	-0.1 ± 1.3	1.000	-0.2 ± 1.4	0.999
Concentration	3.0 ± 1.0	3.5 ± 0.7	4.3 ± 1.0	4.1 ± 0.8	-0.5 ± 0.8	0.916	0.1 ± 0.5	0.993	-1.3 ± 0.7	0.263	-0.6 ± 0.7	0.795
Free from Worry	2.3 ± 0.6	3.0 ± 1.4	2.3 ± 1.5	3.4 ± 1.0	-0.7 ± 1.0	0.914	-1.2 ± 0.7	0.327	0.1 ± 0.9	1.000	-0.4 ± 0.9	0.956
Achievement Motivation	3.7 ± 1.5	2.0 ± .00	4.3 ± 0.5	3.3 ± 1.1	1.7 ± 1.0	0.341	0.9 ± 0.6	0.489	-0.6 ± 0.8	0.884	-1.3 ± 0.8	0.397
Coachability	4.3 ± 0.58	4.0 ± .00	6.0 ± 0.0	5.1 ± 0.9	0.3 ± 0.7	0.958	0.9 ± 0.4	0.229	-1.7 ± 0.6	**0.044****	-1.1 ± 0.6	0.258

Key: *P* = *p*-value <.005; ** Statistically Significant; *n* = Number of Participants; ± = Mean & Standard Deviation

Table 19: Longitudinal results for anthropometric and physical performance measurements in retained Under 16-17s regional players over one season and the effects of birth distribution on development.

Retained U16s 2019-2020	Players Development from First and Second Talent Camps				The Difference in Relative Age over a Season				
	Timepoint 1		Timepoint 2		Actual Difference in H1 and H2		Percentage Difference (%)		
	H1	H2	H1	H2	H1	H2	H1	H2	*P*
Height (cm)	178.4 ± 5.2	176.9 ± 5.0	181.7 ± 4.6	177.2 ± 5.2	1.1 ± 0.76	1.1 ± 1.0	0.8% ± 0.8%	0.9% ± 1.2%	0.674
Weight (kg)	83.6 ± 19.1	75.7 ± 18.4	86.1 ± 8.6	83.3 ± 9.1	5.6 ± 3.3	7.6 ± 3.1	7.2% ± 4.6%	10.5% ± 5.0%	0.075
Bronco (s)	313 ± 23.6	313 ± 36.6	329 ± 24.2	337 ± 50.7	16.1 ± 21.2	24.2 ± 24.9	8.1% ± 7.5%	4.4 ± 6.8%	0.189
CMJ (cm)	49.5 ± 6.1	46.4 ± 8.9	48.0 ± 5.0	45.0 ± 6.6	0.3 ± 9.4	1.0 ± 4.8	-2.7% ± 21.1%	0.4% ± 15.5%	0.676
DH Grip Strength (kg)	40.0 ± 4.9	38.9 ± 7.5	44.0 ± 4.6	45.8 ± 5.7	4.0 ± 3.8	6.1 ± 3.4	13.5% ± 10.8%	14.3% ± 13.8%	0.863
NDH Grip Strength(kg)	37.5 ± 6.0	36.5 ± 7.5	39.6 ± 5.5	42.1 ± 5.1	3.5 ± 5.6	4.6 ± 3.4	15.5% ± 12.8%	16.5% ± 16.0%	0.860
10m Sprint (s)	1.78 ± 0.06	1.81 ± 0.1	1.83 ± 0.08	1.85 ± 0.1	0.05 ± 0.1	0.03 ± 0.1	2.8% ± 2.9%	1.5% ± 5.8%	0.444
40m sprint (s)	5.64 ± 0.30	5.71 ± 0.4	5.64 ± 0.30	5.74 ± 0.3	-0.00 ± 0.2	0.03 ± 0.38	-0.1% ± 4.0%	0.8% ± 7.0%	0.689
Momentum (kg/ms)	592 ± 61.0	546 ± 146.0	530 ± 53.3	591 ± 124.2	37.3 ± 33.9	45.0 ± 35.8	6.7% ± 6.1%	9.8% ± 9.0%	0.306
Power (w)	1492 ± 357.2	1373 ± 306.8	1644 ± 268.1	1508 ± 269.2	321 ± 586.0	235 ± 520.1	11.8% ± 19.3%	14.4% ± 19.3%	0.734
PAP (w)	4539 ± 750.9	4283 ± 655.4	4283 ± 655.4	4518 ± 517.5	83 ± 338.8	136 ± 186.3	7.7% ± 15.7%	8.2% ± 13.8%	0.941

Key: *Sig.* = significance values $p < 0.05$; H*1 and H2* = Half year birth distributions, H1 = 1st September – 28th/29th February; and H2 = 1st March – 31st August

Table 20: Longitudinal results for anthropometric and physical performance measurements in retained Under 17-18s regional players over one season and the effects of birth distribution on development

Retained U17s 2019-2020	Players Development from First and Second Talent Camps				The Difference in Relative Age over a Season				
	Timepoint 1		Timepoint 2		Actual Difference in H1 and H2		Percentage Difference (%)		
	H1	H2	H1	H2	H1	H2	H1	H2	*P*
Height (cm)	180.0 ± 3.9	181.6 ± 6.5	7181.6 ± 3.9	181.6 ± 6.5	1.0 ± 0.71	0.60 ± 0.43	0.6% ± 0.4%	0.3% ± 0.2%	0.159
Weight (kg)	81.9 ± 11.9	80.1 ± 11.0	88.6 ± 11.0	85.9 ± 15.5	6.7 ± 2.8	5.8 ± 4.8	7.8% ± 3.4%	6.2% ± 3.9%	0.398
Bronco (s)	306 ± 19.8	299 ± 16.7	320 ± 33.4	334 ± 34.1	14.3 ± 23.9	35.3 ± 26.8	8.9% ± 2.7%	5.7 ± 9.2%	0.483
CMJ (cm)	53.5 ± 8.6	57.3 ± 8.3	53.3 ± 8.7	52.9 ± 6.3	-1.3 ± 5.4	-3.9 ± 3.8	-1.8% ± 10.2	-6.0% ± 6.1%	0.395
DH Grip Strength (kg)	49.1 ± 5.7	47.2 ± 2.6	52.9 ± 6.5	49.7 ± 2.9	3.5 ± 2.5	3.1 ± 3.4	7.2% ± 5.1%	6.7% ± 5.3%	0.850
NDH Grip Strength(kg)	45.9 ± 5.3	42.8 ± 3.4	49.2 ± 6.3	47.0 ± 3.5	3.0 ± 2.7	0.9 ± 5.6	6.6% ± 5.9%	10.3% ± 7.7%	0.339
10m Sprint (s)	1.78 ± 0.1	1.71 ± 0.10	1.78 ± 0.10	1.71 ± 0.08	0.01 ± 0.0	0.01 ± 0.0	0.3% ± 1.8%	-0.5% ± 0.9%	0.347
40m sprint (s)	5.46 ± 0.2	5.35 ± 0.19	5.48 ±0.21	5.39 ± 0.25	0.04 ± 0.1	0.04 ± 0.1	0.8% ± 1.3%	0.7% ± 1.1%	0.933
Momentum (kg/ms)	591 ± 66.5	597 ± 82.9	641 ± 62.7	632 ± 111.4	48.4 ± 21.9	34.3 ± 27.4	8.5% ± 4.1%	5.4% ± 3.7%	0.176
Power (w)	1642 ± 198.0	1607 ± 110.1	1674.0 ± 370.9	1634 ± 42.2	-38.3 ± 976.0	-36.2 ± 298.7	8.8% ± 8.5%	2.5% ± 7.7%	0.176
PAP (w)	4911 ± 343.0	4998 ± 319.	4874 ± 966.8	4962 ± 114.1	215.1 ± 358.6	-130± 399.3	4.7% ± 7.2%	-3.9% ± 13.6%	0.151

Key: *Sig.* = significance values $p < 0.05$; H*1 and H2* = Half year birth distributions, H1 = 1st September – 28th/29th February; and H2 = 1st March – 31st August

Table 21: Longitudinal results for psychological assessments in retained Under 16-17s regional players over one season and the effects of birth distribution on development.

Retained U16s 2019-2020	Players Development from First and Second Talent Camps				The Difference in Relative Age over a Season				
	Timepoint 1		Timepoint 2		Actual Difference in H1 and H2		Percentage Difference (%)		
	H1	H2	H1	H2	H1	H2	H1	H2	*P*
Outcome Focus	8.6 ± 1.6	8.6 ± 1.4	8.2 ± 1.2	8.1 ± 1.8	0.0 ± 1.5	-0.1 ± 1.8	3.0% ± 24.3%	0.3% ± 22.8%	0.677
Mastery Focus	9.3 ± 1.1	8.9 ± 1.3	9.1 ± 0.8	8.8 ± 1.4	-0.5 ± 1.5	-0.3 ± 1.4	-3.6% ± 19.8%	-3.3% ± 15.5%	0.962
Commitment	8.1 ±1.4	8.0 ± 1.1	9.3 ± 1.0	7.9 ± 1.2	-0.1 ± 1.3	-0.4 ± 1.6	0.7% ± 17.0%	-1.7% ± 19.0%	0.620
Athlete Burnout	31.9 ± 6.2	31.6 ± 6.7	30.7 ± 5.4	29.6 ± 7.7	-0.3 ± 5.6	-1.1 ± 8.5	0.6% ± 18.9%	-1.2% ± 30.9%	0.782
Exhaustion	10.0 ± 3.3	9.9 ± 2.7	9.7 ± 2.8	9.2 ± 3.0	-0.1 ± 2.9	-0.5 ± 3.4	2.9% ± 34.9%	-4.0% ± 34.3%	0.487
RS. Accomplishment	13.4 ± 2.2	13.0 ± 2.7	12.9 ± 2.2	12.1 ± 3.2	-0.4 ± 3.6	-0.8 ± 3.8	0.2% ± -3.0%	-3.0% ± 33.3%	0.699
Sport Devaluation	8.5 ± 2.7	8.8 ± 3.0	8.0 ± 2.0	8.2 ± 2.9	-0.2 ± 2.9	0.2 ± 3.8	7.5% ± 40.7%	12.5% ± 54.3%	0.700
Life Stress	9.5 ± 3.0	9.9 ± 2.5	9.6 ± 2.8	9.5 ± 2.3	0.1 ± 4.6	-0.4 ± 4.1	16.5% ± 65.0%	9.3% ± 46.0%	0.655
Training stress	9.4 ± 3.1	10.1 ± 3.0	9.5 ± 2.9	9.1 ± 3.2	0.1 ± 4.3	-1.0 ± 5.0	25.4% ± 78.8%	12.8% ± 72.9%	0.553
Athlete Identity	7.0 ± 1.9	6.8 ± 2.1	6.5 ± 1.8	6.5 ± 1.8	-0.2 ± 2.0	0.1 ± 2.4	1.5% ± 33.3%	11.3% ± 49.7%	0.385
Optimism	14.6 ± 2.6	14.7 ± 2.1	14.0 ± 2.7	13.1 ± 3.0	0.0 ± 2.4	-1.0 ± 2.7	3.8% ± 29.6%	-5.4% ± 20.3%	0.211
Alexithymia	17.1 ± 2.8	15.9 ± 2.8	15.0 ± 2.8	14.9 ± 2.9	-1.1 ±3.4	-0.8 ± 3.6	-5.8% ± 14.7%	2.0% ± 23.7%	0.135
Perfectionistic Concerns	14.9 ± 2.8	14.5 ± 2.6	13.6 ± 2.5	13.1 ± 2.6	0.5 ± 3.8	-0.3 ± 1.6	-3.9% ± 16.1%	-2.4% ± 19.8%	0.762
Perfectionistic Striving	7.1 ± 1.1	7.4 ± 3.8	6.4 ± 1.3	6.1 ± 1.4	0.0 ± 3.5	-0.5 ± 3.0	3.8% ± 52.9%	-1.0% ± 29.1%	0.706
Self-Esteem	13.8 ± 2.5	14.4 ± 3.3	12.5 ± 3.3	13.0 ± 3.0	0.5 ± 2.8	0.6 ± 3.7	5.2% ± 22.0%	16.1% ± 62.2%	0.357
Extraversion	8.5 ± 1.5	8.8 ± 1.8	7.9 ± 11.4	9.1 ± 1.4	0.3 ± 2.6	1.2 ± 2.4	11.5% ± 41.6%	15.4% ± 28.6%	0.693
Agreeableness	8.7 ± 1.5	9.1 ± 1.4	8.6 ± 1.4	9.3 ± 2.2	0.4 ± 1.7	0.7 ± 2.2	7.5% ± 23.5%	9.7% ± 25.0%	0.744
Conscientiousness	8.4 ± 1.7	9.1 ± 2.7	8.2 ± 1.4	9.4 ± 2.5	0.7 ± 3.4	1.2 ± 2.9	12.8% ± 39.7%	18.0% ± 36.6%	0.622
Emotional Stability	7.8 ± 1.3	8.9 ± 2.6	8.0 ± 1.2	9.1 ± 2.5	1.0 ± 2.5	1.2 ± 2.8	12.5% ± 36.6%	32.3% ± 59.3%	0.128
Openness	8.6 ± 1.7	9.5 ± 2.1	8.5 ± 1.4	9.7 ± 2.3	0.9 ± 2.8	1.2 ± 2.7	14.9% ± 33.8%	17.0% ± 31.1%	0.816

Key: *Sig.* = significance values $p < 0.05$; H*1 and H2* = Half year birth distributions, H1 = 1st September – 28th/29th February; and H2 = 1st March – 31st August

Table 22: Longitudinal results for psychological assessments in retained Under 17-18s regional players over one season and the effects of birth distribution on development.

Retained U17s 2019-2020	Players Development from First and Second Talent Camps				The Difference in Relative Age over a Season				
	Timepoint 1		Timepoint 2		Actual Difference in H1 and H2		Percentage Difference (%)		
	H1	H2	H1	H2	H1	H2	H1	H2	*P*
Outcome Focus	8.7 ± 1.4	9.0 ± 1.1	8.3 ± 1.4	8.6 ± 1.2	0.3 ± 1.3	0.3 ± 1.8	6.0% ± 18.7%	6.9% ± 23.1%	0.910
Mastery Focus	8.8 ± 1.2	9.1 ± 1.1	9.0 ± 1.0	9.3 ± 1.0	0.3 ± 1.0	0.3 ± 1.1	4.2% ± 12.8%	3.6% ± 12.1%	0.889
Commitment	7.4 ± 1.6	7.3 ± 1.4	7.8 ± 1.1	6.8 ± 0.9	-0.1 ± 1.9	-0.9± 0.9	1.4% ± 29.4%	-11.1% ± 11.0%	0.171
Athlete Burnout	29.9 ± 5.1	32.3 ± 7.5	31.8 ± 5.1	32.2 ± 6.2	2.5 ± 6.3	0.3 ± 5.1	10.3% ± 20.5%	1.7% ± 17.2%	0.241
Exhaustion	9.4 ± 2.6	11.2 ± 2.9	10.3 ± 2.9	11.9 ± 3.6	1.8 ± 2.5	1.7 ± 2.5	22.1% ± 31.1%	10.2% ± 31.6%	0.806
RS. Accomplishment	13.1 ± 2.6	12.1 ± 3.0	14.0 ± 1.6	12.3 ± 2.3	-1.1 ± 4.3	-1.7 ± 3.2	-3.4% ± 36.5%	-10.1% ± 25.2%	0.584
Sport Devaluation	7.4 ± 2.0	9.2 ± 3.2	7.6 ± 2.0	7.9 ± 2.1	1.8 ± 2.2	0.3 ± 1.8	23.8% ± 26.8%	6.8% ± 25.4%	0.092
Life Stress	9.3 ± 3.4	8.7 ± 2.5	9.7 ± 3.0	8.5 ± 2.3	-0.7 ± 5.0	-1.2 ± 3.8	-2.0% ± 62.2%	0.1% ± 51.1%	0.925
Training stress	9.2 ± 3.8	8.8 ± 2.7	10.2 ± 3.0	8.6 ± 2.8	-0.4 ± 5.5	-1.6 ± 4.3	-13.9% ± 36.2%	-4.4% ± 49.1%	0.561
Athlete Identity	5.8 ± 3.3	6.4 ± 2.2	6.5 ± 2.8	5.6 ± 1.1	0.6 ± 3.2	0.9 ± 2.5	10.5% ± 87.3%	-18.5% ± 15.7%	0.289
Optimism	12.3 ± 6.1	14.3 ± 2.9	11.5 ± 4.6	13.8 ± 1.9	2.0 ± 5.2	2.3 ± 5.4	-0.0% ± 15.7%	14.8% ± 34.1%	0.149
Alexithymia	14.0 ± 7.1	14.6 ± 3.2	15.3 ± 5.5	15.6 ± 3.5	0.6 ± 8.0	0.3 ± 7.2	-12.6% ± 22.5%	-6.7% ± 21.6%	0.512
Perfectionistic Concerns	11.4 ± 5.9	13.2 ± 3.0	12.1 ± 4.3	13.3 ± 2.6	2.3 ± 7.0	1.8 ± 5.5	-0.74% ± 21.9%	-1.3% ± 17.3%	0.940
Perfectionistic Striving	6.1 ± 3.0	7,5 ± 5.30	5.8 ± 2.1	7.5 ± 5.3	1.8 ± 5.4	1.2 ± 5.3	1.0% ± 25.7%	-0.1% ± 21.7%	0.913
Self-Esteem	12.7 ± 5.1	13.4 ± 2.8	11.5 ± 5.8	13.9 ± 2.8	0.8 ± 4.6	2.4 ± 6.2	-0.9% ± 21.8%	1.5% ± 21.6%	0.791
Extraversion	7.4 ± 3.3	9.2 ± 2.3	6.8 ± 3.3	9.3 ± 1.8	1.7 ± 3.5	2.6 ± 3.6	8.7% ± 28.6%	20.6% ± 27.7%	0.292
Agreeableness	**8.2 ± 3.4**	**8.5 ± 1.7**	**7.1 ± 3.6**	**9.3 ± 1.7**	**1.8 ± 3.4**	**2.3 ± 4.1**	**-9.7% ± 27.9%**	**13.4% ± 12.3%**	**0.021****
Conscientiousness	7.1 ± 2.9	8.9 ± 2.6	6.2 ± 3.0	8.5 ± 3.3	-0.1 ± 3.8	2.3 ± 2.9	14.6% ± 38.7%	25.3% ± 60.2%	0.585
Emotional Stability	6.6 ± 2.9	9.1 ± 2.9	6.0 ± 3.0	9.6 ± 3.1	3.0 ± 3.7	3.0 ± 3.8	31.0% ± 30.6%	26.3% ± 58.9%	0.788
Openness	7.5 ± 3.0	9.4 ± 2.0	6.9 ± 3.5	10.6 ± 1.7	1.9 ± 3.2	3.7 ± 3.5	14.0% ± 27.3%	33.8% ± 33.1%	0.116

Key: *Sig.* = significance values $p < 0.05$; H*1 and H2* = Half year birth distributions, H1 = 1st September – 28th/29th February; and H2 = 1st March – 31st August

Athlete questionnaire 1

You are about to complete a survey that will help us understand more about the type of athlete you are. This survey has been developed by researchers at Bangor University and Rugby Gogledd Cymru as part of a KESS funded project. The aim of the project is to study the psychological components of academy level players. This research will help develop knowledge on how best to support academy level players.

The survey comes in two blocks. The first part of the survey is about your rugby experiences to date, the second part asks about your competition experiences, training behaviours and your personality. Each section contains a series of statements. Please read each statement carefully and then decide the extent to which you agree or disagree with the statement by circling the number that is most relevant. Please try to answer the statements as carefully and as honestly as possible. You may or may not think that some of the things we are asking about are surprising, sensitive, or somewhat private, and may be wondering why we are asking them. We are asking these questions in an attempt to gain as complete an understanding of you as possible. The more we know about athletes, the better we can understand the factors that influence an athletes' progression, and the better we are able to support athletes.

We take confidentiality very seriously, particularly as we are asking questions about you and your life to this point. **There are no right or wrong answers in the survey, and your answers will not affect your position in the squad**. None of the information will be passed on without your permission, except in circumstances where you or someone else is at risk. Please speak to a member of the research team about this if you have any questions so we can make sure that only appropriate information is passed on. Just to re-iterate, your answers will not affect your position in the squad, the aim is simply to be able to better understand you so that you can be coached and supported as best as possible.

NAME: _____

DATE OF BIRTH: _____

WEST SOUTH EAST

HISTORIC AND DEMOGRAPHIC INFORMATION

1. How many years have you been playing Rugby?

   _____

2. Please circle your main position or positions?

   1 2 3 4 5 6 7 8
   9 10 11 12 13 14 15

3. What is the highest competitive level you have played at?

   International ☐ **National** ☐ **Regional** ☐ **Club** ☐

4. How long have you played at this competitive level?

   _____

5. How many hours of physical activity do you do in a week?

   1 to 5 hours ☐ 6 to 10 hours ☐ 11 to 15 hours ☐ 16 to 20 hours ☐
   21 to 25 hours ☐ 26 to 30 hours ☐ 30 + hours ☐

6. How often do you train with RGC in a week?

   _____

7. Have you suffered any injuries during your sporting career?

   YES ☐ **NO** ☐

   If **YES**, please provide details below of the injury, the severity and its impact on your training and participation in sport.

   _____
   _____
   _____
   _____

8. Do you attend School or College?

   YES ☐ **NO** ☐

9. Are you employed? **YES** ☐ **NO** ☐

   If **YES,** how many hours a week do you work? _____

TRAINING AND COMPETITIVE BEHAVIOURS

Below are some considerations to your interest and performance in rugby participation. When answering the following items please indicate how often you relate to the statements by considering "How often do you feel this way?". There are no right or wrong answers.

Almost Never	Rarely	Sometimes	Frequently	Almost Always
1	2	3	4	5

I am accomplishing many worthwhile things in rugby.

1 2 3 4 5

I feel so tired from my training that I have trouble finding energy to do other things.

1 2 3 4 5

The effort I spend in rugby would be better spent doing other things.

1 2 3 4 5

I feel overly tired from my rugby participation.

1 2 3 4 5

I don't feel confident about my rugby ability.

1 2 3 4 5

I don't care as much about my rugby participation as I used to.

1 2 3 4 5

I am not performing to my ability in rugby.

1 2 3 4 5

I feel "wiped out" from rugby.

1 2 3 4 5

I'm not into rugby like I used to be.

1 **2** **3** **4** **5**

I feel physically worn out from rugby.

1 **2** **3** **4** **5**

I feel less concerned about being successful in rugby than I used to.

1 **2** **3** **4** **5**

I feel like I don't have the energy for rugby.

1 **2** **3** **4** **5**

It seems that no matter what I do, I don't play as well as I should.

1 **2** **3** **4** **5**

I feel successful in rugby.

1 **2** **3** **4** **5**

I wonder if rugby is worth all the time and energy I put into it.

1 **2** **3** **4** **5**

Below are some reasons why people participate in sport. Using the scale provided, please indicate how true each of the following statements is for you. When deciding if this is one of the reasons why you participate, please think about all the reasons why you participate. There are no right or wrong answers, so do not spend too much time on any one question and please answer as honestly as you can.

Not true at all | Somewhat True | Very True

1 2 3 4 5 6 7

I participate in my sport….

because it's fun

1 2 3 4 5 6 7

but I question why I continue

1 2 3 4 5 6 7

because I feel pressure from other people to play

1 2 3 4 5 6 7

because I feel obligated to continue

1 2 3 4 5 6 7

because the benefits of sport are important to me

1 2 3 4 5 6 7

because it teaches me self-discipline

1 2 3 4 5 6 7

because what I do in sport is an expression of who I am

1 2 3 4 5 6 7

because I enjoy it

1 2 3 4 5 6 7

but I wonder what's the point

1 2 3 4 5 6 7

because people push me to play

1 2 3 4 5 6 7

because I would feel guilty if I quit

1 2 3 4 5 6 7

because it's an opportunity to just be who I am

1 2 3 4 5 6 7

Here are some reasons why Individuals direct their behaviour towards attaining goals please indicate how true the following statements is for you.

Not at all me	Not Me	Sometimes Me	Me	Very Me
1	2	3	4	5

When playing sport, I feel successful when I beat other people.
1 2 3 4 5

When playing sport, I feel successful when I outperform my opponents.
1 2 3 4 5

When playing sport, I feel successful when I perform to the best of my ability.
1 2 3 4 5

When playing sport, I feel successful when I show clear personal improvements.
1 2 3 4 5

Here are a couple of statements why people are dedicated to a sport. Using the 5-point Likert scale please indicate how true the following statements are for you.

Never	Seldom	Sometimes	Very often	Always
1	2	3	4	5

No matter what is going on in my life, I still turn in a good training session.
1 2 3 4 5

I always produce a high-quality training session.
1 2 3 4 5

*Please consider your life **outside of rugby** and the challenges you face in that environment and answer the items below.*

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

In the last week, how often have you felt that you were unable to control the important things in your life?

0 1 2 3 4

In the last week, how often have you felt confident about your ability to handle your personal problems?

0 1 2 3 4

In the last week, how often have you felt that things are going your way?

0 1 2 3 4

In the last week, how often have you felt difficulties were piling up so high that you could not overcome them?

0 1 2 3 4

*Please consider your life **as a rugby player** and the challenges you face in that environment and answer the items below.*

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

In the last week, how often have you felt that you were unable to control the important things in your life?

0 1 2 3 4

In the last week, how often have you felt confident about your ability to handle your personal problems?

0 1 2 3 4

In the last week, how often have you felt that things are going your way?

0 1 2 3 4

In the last week, how often have you felt difficulties were piling up so high that you could not overcome them?

0 1 2 3 4

Here are several personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which **you agree or disagree with that statement**. You should **rate the extent to which the <u>pair of traits</u> applies to you**, even if one characteristic applies more strongly than the other.

Disagree Strongly 1	**Disagree Moderately 2**	**Disagree a Little 3**	**Neither agree nor disagree 4**	**Agree a little 5**	**Agree Moderately 6**	**Agree Strongly 7**

I see myself as:

Extraverted, enthusiastic. _____

Critical, quarrelsome. _____

Dependable, self-disciplined. _____

Anxious, easily upset. _____

Open to new experiences, complex. _____

Reserved, quiet. _____

Sympathetic, warm. _____

Disorganized, careless. _____

Calm, emotionally stable. _____

Conventional, uncreative. _____

The following statements refer to your ability to look at negative situations realistically and how you recover quickly from difficult situations.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

I tend to bounce back quickly after hard times.

1 2 3 4 5

I have a hard time making it through stressful events.

1 2 3 4 5

It does not take me long to recover from a stressful event.

1 2 3 4 5

It is hard for me to snap back when something wrong happens.

1 2 3 4 5

I usually come through difficult times with little trouble.

1 2 3 4 5

I tend to take a long time to get over setbacks in my life.

1 2 3 4 5

Athlete questionnaire 2

You are about to complete a survey that will help us understand more about the type of athlete you are. This survey has been developed by researchers at Bangor University and Rugby Gogledd Cymru as part of a KESS funded project. The aim of the project is to study the psychological components of academy level players. This research will help develop knowledge on how best to support academy level players.

The survey comes in two blocks. The first part of the survey is about your rugby experiences to date, the second part asks about your competition experiences, training behaviours and your personality. Each section contains a series of statements. Please read each statement carefully and then decide the extent to which you agree or disagree with the statement by circling the number that is most relevant. Please try to answer the statements as carefully and as honestly as possible. You may or may not think that some of the things we are asking about are surprising, sensitive, or somewhat private, and may be wondering why we are asking them. We are asking these questions in an attempt to gain as complete an understanding of you as possible. The more we know about athletes, the better we can understand the factors that influence an athletes' progression, and the better we are able to support athletes.

We take confidentiality very seriously, particularly as we are asking questions about you and your life to this point. **There are no right or wrong answers in the survey, and your answers will not affect your position in the squad**. None of the information will be passed on without your permission, except in circumstances where you or someone else is at risk. Please speak to a member of the research team about this if you have any questions so we can make sure that only appropriate information is passed on. Just to re-iterate, your answers will not affect your position in the squad, the aim is simply to be able to better understand you so that you can be coached and supported as best as possible.

Welcome to your second questionnaire which focuses on your competition experiences, training behaviours and your personality. Each section contains a series of statements. Please read each statement carefully and then decide the extent to which you agree or disagree with the statement by circling the number that is most relevant.

NAME: _____

DATE OF BIRTH: _____

WEST SOUTH EAST

Below are a couple of statements relating to how you perceive your role as an athlete.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	2	3	4	5

My sport offers me more than anything in life (e.g., friends, family, relationships, and money)

1 2 3 4 5

My sport is the most important thing in my life

1 2 3 4 5

Below is a list of statements regarding your mental attitude towards your beliefs.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	2	3	4	5

In uncertain times, I usually expect the best.

1 2 3 4 5

I always look on the bright side of things.

1 2 3 4 5

I'm always optimistic about my future.

1 2 3 4 5

I'm a believer in the idea that “every cloud has a silver lining".

1 2 3 4 5

Below is a list of statement regarding your ability to identify and describe your emotional awareness.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	2	3	4	5

I have feelings that I can't quite identify

1 2 3 4 5

I don't know what's going on inside me

1 2 3 4 5

It is difficult for me to find the right words for my feelings

1 2 3 4 5

I find it hard to describe how I feel about people

1 2 3 4 5

Being in touch with my emotions is essential

1 2 3 4 5

I find examination of my feelings useful in solving personal problems.

1 2 3 4 5

Below are comments made by athletes about their performance standards.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	2	3	4	5

During training, I get completely furious if I make mistakes.

1 2 3 4 5

During competitions, I get completely furious if I make mistakes.

1 2 3 4 5

During competitions, I get frustrated if I do not fulfil my high expectations.

1 2 3 4 5

During training, I get frustrated if I do not fulfil my high expectations.

1 2 3 4 5

I have extremely high goals for myself in my sport.

1 2 3 4 5

I feel that other performers generally accept lower standards for themselves in sport than I do.

1 2 3 4 5

Below are statements regarding how you value and perceive yourself in rugby.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	2	3	4	5

I think that I sometimes try to prove my worth

1 2 3 4 5

My self-esteem is far too dependent on my achievements

1 2 3 4 5

At times, I have to be better that others to be good enough myself

1 2 3 4 5

Occasionally I feel obsessed to accomplish something of value

1 2 3 4 5

Below is a list of comments made by athletes on how they monitor their feelings and emotions of other people.

Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	2	3	4	5

I know why my emotions change
1 2 3 4 5

I easily recognize my emotions as I experience them
1 2 3 4 5

I can tell how people are feeling by listening to the tone of their voice
1 2 3 4 5

By looking at their facial expressions I recognize the emotions people are experiencing
1 2 3 4 5

I seek out activities that make me happy
1 2 3 4 5

I have control over my emotions
1 2 3 4 5

I arrange events others enjoy
1 2 3 4 5

I help other people feel better when they are down
1 2 3 4 5

When I am in a positive mood I am able to come up with new ideas
1 2 3 4 5

I use good moods to help myself keep trying in the face of obstacles
1 2 3 4 5

Below are a list of statements relating to how you react to certain aspects of your performance.

Almost Never **Sometimes** **Often** **Almost Always**

0 **1** **2** **3**

I maintain emotional control no matter how things are going for me.

0 **1** **2** **3**

When things are going badly, I tell myself to keep calm, and this works for me.

0 **1** **2** **3**

To me, pressure situations are challenges that I welcome.

0 **1** **2** **3**

The more pressure there is during a game, the more I enjoy it.

0 **1** **2** **3**

On a daily or weekly basis, I set very specific goals for myself that guide what I do

0 **1** **2** **3**

I tend to do lots of planning about how to reach my goals

0 **1** **2** **3**

I handle unexpected situations in my sport very well.

0 **1** **2** **3**

When I am playing sports, I can focus my attention and block out distractions

0 **1** **2** **3**

While competing, I worry about making mistakes or failing to come through

0 **1** **2** **3**

I put a lot of pressure on myself by worrying how I will perform

0 **1** **2** **3**

I feel confident that I will play well.

0 **1** **2** **3**

I get the most out of my talent and skills

0 **1** **2** **3**

If a coach criticizes or yells at me, I correct the mis take without getting upset about it

0 **1** **2** **3**

I improve my skills by listening carefully to advice and instruction from coaches and managers.

0 **1** **2** **3**

RGC Age Grade
Talent Identification and Development Project.

Parent/Guardian your name

_____

Your son/dependents name

_____

Your son/dependents name

U16 ☐
U18 ☐

Invitation to take part - Your son/dependent is being invited to take part in a research study, as a potential member of the Rygbi Gogledd Cymru (RGC) age grade squads. Before agreeing for them to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. If you wish, please discuss it with friends, relatives or staff at RGC. Please ask us if there is anything that is not clear or if you would like more information. Take time to decide whether you agree to your son to take part, or not.

What is the background of the study? - Talent identification (TID) programs are an integral part of the selection process for athletes. TID programs vary but usually incorporate some combination of physical and psychological assessments alongside the assessment of sport performance. However, many programs do not measure all of these factors together and fail to consider the long-term development of young athletes. A more effective approach is to combine all of these factors and consider them long-term with respect to maturation. Currently, RGC uses a number of physical tests as part of their TID

program, we have simply added some additional physical and psychological tests (see **Table 1** and **Table 2** at the end of this form for more detail). Therefore, the aim of this research will be to assess physical and psychological qualities of players and interpret this data on a long-term basis with respect to maturation, this may help the development of individual players and ascertain what types of players are successful within the rugby program.

Does my son/dependent have to take part? - This is entirely your decision. Even if you do decide that it is OK for your son/dependent to take part in the study they are free to withdraw at any time point without giving a reason and this will not affect their relationship with the School of Sport, Health, and Exercise Sciences, RGC or any of the researchers involved. Any information collected during the study will be treated confidentially.

What is required of my son/dependent if they take part?- As part of the talent identification process within the RGC age-grade structure, your son/dependent will undergo certain athlete monitoring tests, including physical and performance tests and completing psychological questionnaires. These tests will predominantly be carried out during the talent camps on the 20th (U16) of February and 5th (U18) of March 2020, and if selected to represent RGC some of these tests will be repeated during the pre-season and competitive season between July 2020 and May 2021.

What do I have to do? - You simply continue with the training and competition requirements of the RGC age grade system. There are no additional lifestyle or nutritional restrictions by taking part in this study.

What are the possible disadvantages and risks of taking part? There are no additional risks by taking part in this study. There is a time commitment during the talent identification camp, which will include; filling out questionnaires and participating in physical and fitness tests. However, this will be factored into the program for the day and help will be available to fill in the questionnaires.

What are the possible benefits of taking part? - By participating in the study means we will be able to monitor your progress and response to training in a more detailed manner.

Confidentiality - All information which is collected about you during the course of the research will be kept strictly confidential between research staff and RGC staff. Some of the information (excluding psychological questionnaires) will have your names attached to the data so that it can be used by RGC staff to individually tailor your training during pre-season (see **Table 1**). This information will be stored on WRU password protected laptops at Parc Eirias offices. Information from the psychological questionnaires (see **Table 2**) and any information used by the University will have your name removed so that you cannot be recognised from it. It will not be possible to identify you in any report or publication that may arise from the study and the data will only be stored for 5-years. None of the information from the psychological questionnaires will be used for selection or player retention purposes.

Who is organising or funding the research? - This research is organised by the named researchers and funded by the School of Sport, Health and Exercise Sciences at Bangor University. The School has been given permission by RGC to run this research project.

Who has reviewed the study? - This study has been reviewed and approved by the Ethics Committee of School of Sport, Health and Exercise Sciences at Bangor University.

Feedback on Conduct of Research - The School of Sport, Health and Exercise Sciences is always keen to hear the views of research participants about their experience. If you would like to feedback, please ask the researcher to provide you with Form 6 – Participant Feedback Form – from the Ethics Guidelines Handbook. Completion of this form is optional. The completed form should be returned to Dr Jonathan Moore, Chair, Research Ethics Committee, SSHES, Bangor University, Bangor LL57 2PZ. All information will be treated in a strictly confidential manner.
You are also welcome to contact the University's assigned data protection officer (DPO) if for any reason you wish to. The DPO at Bangor University can be contacted on these details: Mrs Gwenan Hine: gwenan.hine@bangor.ac.uk; 01248 382413

Any Questions?
Please ask us if you have any questions (names and contact details below). You should not sign the form consenting to take part in the study if you still have unanswered questions or any doubts.

Dr Julian Owen
Lecturer in Sport Physiology
School of Sport, Health and Exercise Sciences, Bangor University, Bangor, Gwynedd, Wales, LL57 2PZ
Tel: 01248 38 2197
Email: j.owen@bangor.ac.uk

Mr Josh Leach
Performance Manager (North Wales)
Welsh Rugby Union Group, Eirias Park, Abergele Road, Colwyn Bay
Tel: 07745 685 764
Email: jleach@wru.wales

Schedule of the physical tests for potential and selected U16 and U18 squads.

Tests for the Talent Camp 20th February / 5th March 2020
Beginning and end of pre-season 2020
Monthly monitoring during the 2020-2021 season

Height

Weight

Sitting height

Grip strength test

Countermovement jump test

Squat Jump

10 and 40m sprint

Agility test

Schedule of the psychological questionnaires for potential and selected U16 and U18 squads.

Questionnaires
Talent camp 20th February / 5th March 2020
Beginning and end of pre-season 2020
Monthly monitoring during the 2020-21 season

Personality Questionnaire Items

- Historical playing, training and injury data
- Burnout
- Motivation
- Goal Orientation
- Commitment
- Global & Training Stress
- Big Five Personality
- Resilience
- Athlete Identity
- Optimism
- Alexithymia
- Perfectionism
- Self-Esteem
- Emotional Intelligence
- Coping Strategies

To consent please click on all the text boxes below (so that each are highlighted in red), or contact us if you have questions. Then date and sign the consent form.

☐ I confirm that I have read and understand the Information for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

☐ I certify that I understand the procedures to be used and have fully explained them to the above named child/dependent.

☐ I understand that my child's/dependent's participation is voluntary and that he/she is free to withdraw at any time without giving a reason, without his/her medical care or legal rights being affected.

☐ I understand that I may register any complaint I might have about this experiment with the Head of the School of Sport, Health and Exercise Sciences, and that I will be offered the opportunity of providing feedback on the experiment using the standard report forms.

☐ I agree to the above named child/dependent taking part in the above study.

Date of consent

_____

Signature

_____

ETHICS FORM

Prifysgol Bangor University

YSGOL GWYDDORAU CHWARAEON, IECHYD AC YMARFER

SCHOOL OF SPORT, HEALTH AND EXERCISE SCIENCES

Please complete <u>all</u> parts of this form.

Please attach consent and information/debriefing sheets to <u>all</u> applications

Type of project requiring approval (*tick one box only*)

☐ Staff project ☐ PhD project

☑ Masters by Research project ☐ Undergraduate project

☐ Class demonstration

1	Title of project	Development of a holistic talent identification framework in youth rugby union players.
2	Name and e-mail address(es) of all researcher(s)	Miss Jessica Hughes – peu8cd@bangor.ac.uk
3	Name and e-mail address of supervisor (for student research)	Dr Eleri Jones – eleri.s.jones@bangor.ac.uk Dr Julian Owen – j.owen@bangor.ac.uk Mr Josh Leach – Jleach@wru.wales Mr Gareth Whittaker – GWhittaker@wru.wales
4	Proposed starting date	20th February 2020
5	Proposed duration	9 months
6	What is your research question?	What are the physiological and psychological determinants of selection to regional age grade rugby squads?

		Is selection biased towards chronological age and early biological maturation?

7 **Briefly explain the aims and relevance of your proposed study. Also outline the methodology (1/2 page maximum; express yourself in lay terms i.e. so that it is understandable to a non-specialist in the area)**

Talent identification (TID) programs are an integral part of the selection process for competitive athletes. While many sport organizations utilise TID programs, there does not seem to be a clear set of variables that consistently predict future success. To date TID oriented research has been firmly grounded in either a physiological or psychological paradigm; with little systematic attempt to integrate both perspectives. In addition, studies within youth sport have traditionally extrapolated the characteristics that contribute to expert adult performance and assessed them in junior samples using cross-sectional methodologies (Gabbett et al., 2007; Gil et al., 2007; Mohamed et al., 2009). Longitudinal research designs measuring progression are therefore necessary if the talent development process is to be optimised; however, such approaches within existing research are currently limited (Falk et al., 2004; Elferink-Gemser et al., 2007). In support of this longitudinal approach, physiological characteristics are influenced by the rate of growth and maturation (Philippaerts et al., 2006) and individuals can be (dis) advantaged in cross-sectional studies when performance tasks are compared within chronological annual-age categories (Armstrong et al., 1998). Notably, later-maturing boys are usually outperformed by their earlier-maturing peers (Malina et al., 2004a), which has been demonstrated to lead to the over representative selection of relatively older (Cobley et al., 2009) and early-maturing (Malina et al., 2004b; Sherar et al., 2007) players within competitive youth sport contexts. Whether this development occurs in selected state-based psychological factors associated with sport performance is currently unclear.

Aim: Therefore, the aims of this study are: Part (i) to evaluate the physiological and psychological determinants and the impact of maturation status and relative age on selection of regional U16 and U-18 squads (n=150); and Part (ii) to longitudinally evaluate the impact of maturation status, relative age, and time (and their interactions) on the development of physiological and psychological characteristics in age grade U-16 and U-18 regional rugby union players (n=70).

Methodology: (please see full methodological proposal for details).

8 **Briefly describe the subjects you are planning to use in your study (include age, gender, and special status, e.g. children, learning disabled, vulnerable people).**

Participants will be male, rugby union players (age range 15-17 years), playing for clubs in the RGC-North Wales region, for under-16 and under-18 age groups. Potential participants are nominated by clubs to attend the talent camps (n = 150) which provides a platform to select the regional RGC under-16 and under-18 squads for the following season (2020-21).

9 **Describe how you are going to recruit your participants.**

Parents of the players nominated to attend the talent camps (20th February Under-16 and 5th March Under-18) will be sent an email containing a link to a Qualtrics-based information sheet and informed consent form.

10 **Where will the study take place, e.g. university, school, hospital, athletic club?**

The study will take place at the training centre for RGC; Zip World Stadium, Eirias Park, Abergele Road, Colwyn Bay, LL29 7SP.

11 **How much time will each subject be required to give up for your research project (including travelling time)?**

As part of this project we have added some physical and psychological assessments to an existing talent identification program already running at RGC. Therefore, all assessments are scheduled into the talent camps and subsequent training sessions during the season by Welsh Rugby Union staff and coaches at RGC.

12 **Do you intend to pay participants for their participation?**

☐ YES ☑ NO

If yes, what form will the payment take?

13 **What are the risks to participants (physical and/or psychological)?** Please explain fully what the risks are, how you plan to mitigate these, and **justify their necessity**.

Apart from the obvious risk of physical testing, we envisage no additional risk to the players based on the measurements taken as part of the research project. Before taking part in the talent camps or beginning the age grade program players will have to complete the WRU medical screening questionnaire.

14 **The following research activities are considered to involve more than minimal risk and, consequently, require ethical review by the SSHES Ethics Committee.**

Does your research involve any of the activities?

		YES	NO
i	NHS patients either in hospital or general practice?		✓
ii	Vulnerable groups? e.g., children and young people (i.e. under 18 years), those with a learning disability or cognitive impairment, or individuals in a dependent or unequal relationship.	✓	
iii	Sensitive topics? e.g., participants' sexual behaviour, their ille.g.al or political behaviour, their experience of violence, their abuse or exploitation, their mental health, or their gender or ethnic status.		✓
iv	Groups where permission of a gatekeeper is normally required for initial access to members?		✓
v	Deception or activities which are conducted without participants' full and informed consent at the time the study is carried out? If yes, i) please outline the alternative methodological approaches to your problem that you have discarded. It is simply not enough to say that you cannot obtain the data without the use of deception. You must indicate that you have considered other methodological approaches and that these were not appropriate. ii) in your opinion could the deception cause distress in subjects?		✓
vi	Access to records of personal or confidential information, including genetic and other biological information, concerning identifiable individuals?		✓
vii	Activities which might induce longer term psychological stress, anxiety or humiliation?		✓
viii	Intrusive interventions? e.g., the administration of drugs or other substances, vigorous physical exercise in people deemed 'at risk' (see PAR-Q below), or exposure to extreme physical or psychological conditions which could be injurious.		✓

IF YOU HAVE ANSWERED **YES** TO ANY OF THESE ACTIVITIES (FOR v, THIS ALSO REQUIRES 'YES' FOR vii) THEN YOUR PROJECT MUST BE REFERRED TO THE ETHICS COMMITTEE

(See also NOTES – Insurance cover against Litigation)

15 **How are you going to handle the requirement of confidentiality?**

For the purpose of the research project - All personal information collected during the study will be kept confidential and all player data will be anonymised by replacing names with participant codes. Only the designated members of the research team will have access to participant's personal data during the study. All data collected will be stored on password protected WRU and Bangor University computers.

The results of physical and performance tests collected during the project will form a part of the current RGC age grade player monitoring process. Therefore, this data will not be anonymised as it will be used to inform the training progression of individual players. This data will only be available to the RGC management (Performance manager – Mr Josh Leach) and RGC sport science and medical staff (Head of Strength & Conditioning – Mr Gareth Whittaker). However, for the purposes of research all data will be anonymised.

16 **During your data collection will supervision or assistance be required (e.g. for experiments in the physiology laboratory)?**

YES	NO
☐	☑

If yes, how will supervision be arranged?

17 **How will you obtain informed consent?**

i) How will you inform the subject about what is going to happen to him/her?

Presentations have already been delivered to parents of potential players (February and March 2019), outlining the player pathway and the research project. Before the talent camps in April 2019, parents will be sent an email containing a link to a Qualtrics-based information sheet and informed consent form.

ii) How will the subject give consent?

Parental informed consent will be given electronically via the Qualtrics-based informed consent form.

iii) Does the project involve children?

☑	☐

YES NO

If yes,

- Children under the age of 16, their own consent (where possible) and parental/guardian consent is required (this must be written consent).
- Individuals aged over 16 and under 18 years, only their own consent is legally necessary (this must be written consent), but parental/guardian consent is desirable.

iv) People belonging to vulnerable groups?

☐ YES ☑ NO

If yes,

- Parental/guardian consent is required. If this would offend the dignity of the participant, exception may be made for participants over the age of 18.

18 **Is parental/guardian consent required for your project?**

☑ YES ☐ NO

All of the players will be under 18. In each case we will seek parental consent for these participants if they decide to participate in the study.

19 **If your project requires you to have access to children under the age of 18, police screening needs to be carried out. This requires a Disclosure and Barring Service (DBS) Form to be completed (ask the SSHES School Manager for more information).**

Does police screening need to be carried out?

☐ YES ☑ NO

All physiological assessments and psychological questionnaires during the talent camps and training sessions (during the season), will be administered by WRU medical and coaching staff, who have DBS clearance as part of their roles.

Signature of applicant	**Print Name**	**Date**
	Jessica Hughes	04/02/2020

ETHICS APPROVAL ACTION

Take into account the responses to this form with particular reference to the activities listed in Q14

_____

☐ **This project already has approval under SSHES Ethics No. _____**

(Contact Mark Chitty if you are unsure of the Ethics Register number;

submit completed form to the General Office)

……. ……..…… …….....

Signature – supervising staff member Print Name Date

_____

☐ **This project does NOT require referral to the Ethics Committee**

(Submit completed form to the General Office)

……. ……..…… .....

Signature – supervising staff member Print Name Date

……..…..... .....

Signature of second staff member Print Name Date

(e.g. cross moderator for student projects)

……..…..... .....

Signature of third staff member Print Name Date

(e.g. member of Ethics Committee)

_____

☐ **This project requires referral to the Ethics Committee**

Submit this form, the information sheet, the customised consent form (Form 2 or 3 as appropriate) and the protocol to the SSHES Ethics Committee for consideration and approval.

If approved, Ethics Committee Chair to sign below in addition to the supervising staff member.

…… ……..…….. .....

Signature – supervising staff member Print Name Date

…… …… …..…….....

Signature granting approval by Print Name Date

Chair of Ethics Committee

(*Dr Anthony Blanchfield)* _____

This completed and signed form must be submitted to the General Office for registration on the SSHES Ethics Register before data collection may commence.