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Perceptions and Determinants of Healthy Eating in High Performing Male Adolescent Rugby Players

A thesis presented in partial fulfilment of the requirements for the degree of

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Abstract

Background: Rugby is a competitive sport in New Zealand, with the leading team, the All Blacks, ranked first in the world. Since nutrition plays an important role in sports performance, understanding how to facilitate young high-performing rugby players to eat healthy will help to optimise their performance. Research is lacking regarding perceptions and determinants of healthy eating for young rugby players, both in New Zealand and internationally. This study aimed to explore perceptions and determinants of healthy eating for high performing male adolescent rugby players living in New Zealand.

Methods: Perceptions and determinants were explored using semi-structural individual interviews. Participants were 20 male high-performing rugby players aged 16 to 18 years. Interviews were recorded and transcribed for thematic analysis of themes.

Results: Perceptions of healthy eating included balance and variety, portions according to energy needs and specific foods. Numerous determinants of healthy eating were described including factors related to the general lifestyle of an adolescent, including peers, family and food availability, cost, convenience and taste of food. Sports-specific determinants relating to participants' athletic lifestyles were sports performance, motivation to perform, team culture and the timing, amount and types of food on the gastrointestinal tract. Some determinants were both general and sports-specific including the media, physical appearance and feeling good.

Conclusion: High-performing male adolescent rugby players living in New Zealand have a good general understanding of the meaning of a healthy diet. A range of determinants influence the diet of these young rugby players, including general and sports-specific determinants from the macro-level, social and physical environment, as well as individual factors. Further research is required to explore the determinants of healthy eating in high-performing male adolescent rugby players both in New Zealand and internationally.

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Abbreviations

Abbreviation	Meaning
ADI	Athlete Diet Index
AES	Australian Eating Survey
AIS	Australian Institute of Sport
AMDR	Acceptable Macronutrient Distribution Range
CARDIA	Coronary Artery Risk Development in Young Adults study
EAGNZA	Eating and Activity Guidelines for New Zealand Adults
GI tract	Gastrointestinal tract
NZANS	New Zealand Adults Nutrition Survey
SSB	Sugar sweetened beverages
UK	United Kingdom
USA	United States of America

Chapter One: Introduction

1.1 Background and Justification for the Research

Rugby is one of New Zealand's most popular and competitive sports, with the All Blacks being the top rugby team in the world. In a survey carried out by Sports New Zealand (2015), rugby was one of the top five team sports played by men in New Zealand. Competition to gain recognition in professional rugby is high, hence, enhancing performance becomes an important factor. One potential way to boost performance is through achieving optimal nutrition to help with energy, recovery and strength.

According to the American College of Sports Medicine, carbohydrates and protein are important nutrients that help with energy and recovery, both important factors in sports performance (Thomas, Erdman, & Burke, 2016). Not only does adequate nutrition help with sports performance, but healthy eating in general helps maintain an optimal physique (Thomas, Erdman, & Burke, 2016). Body weight and composition can impact sports performance through factors such as speed, strength, agility and power (Thomas, Erdman, & Burke, 2016). By determining what factors support young rugby players to eat healthy and meet their nutrient requirements for sport, this information can potentially be used to help boost future rugby performance in New Zealand.

Healthy eating for New Zealand adolescents is considered a diet which follows the Food and Nutrition Guidelines for Healthy Children and Young People Aged 2 to 18 years (Ministry of Health, 2012). These guidelines suggest a healthy diet includes eating a variety of foods from the four food groups, including vegetables and fruit, breads and cereals, dairy products, and lean meats, chicken, seafood, fish, eggs, legumes, nuts and seeds whilst minimising foods high in fat, sugar and salt (Ministry of Health, 2012). It is important that young adolescent rugby players understand healthy eating and appropriate nutrition practices as food choices impact their physical well-being and consequently their sporting performance (Alaunyte, Perry, & Aubrey, 2015). Food intake earlier in life can affect food choices in adulthood, whereby an adequate diet will help to maintain health, minimise injury, improve sporting performance and reduce the risk of numerous lifestyle diseases (Lake, Mathers, Rugg-Gunn, & Adamson, 2006; Yeh, et al., 2008; Meyer, O'Connor, & Shirreffs, 2007). Therefore, adolescence is a critical time for athletes to develop healthy eating practices, not only for their sporting performance, but also for their future health.

It has been shown that young athletes tend to have poor nutritional knowledge regarding the principles of sports nutrition, do not follow the appropriate diet for their sport, and have unhealthy

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dietary habits (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). Although, nutrition knowledge and understanding are important factors in leading a healthy lifestyle, knowledge does not always translate to action, therefore, understanding how to best support young athletes to make healthy food choices is key. Exploring the perceptions of healthy eating, as well as associated enablers and barriers to healthy eating, including the macro-level, physical and social environments and individual factors, will help coaches, sporting managers and sports dietitians to understand what support young athletes need to make healthy food choices.

There have been a number of studies exploring the facilitators and barriers of healthy eating in adolescents and athletes in countries outside of New Zealand. For adolescents, important determinants of healthy eating include food availability at school (Shepherd, et al., 2006; Kumar, et al., 2016), cost of food (Shepherd, et al., 2006; Kumar, et al., 2016; Ashton, et al., 2015; Raine, 2005; Willows, 2005) social factors such as family (Kumar, et al., 2016; Raine, 2005) and peers (Shepherd, et al., 2006; Kumar, et al., 2016; Ashton, et al., 2015; Raine, 2005), and culture (Raine, 2005; Willows, 2005). Individual factors influencing healthy eating choices of adolescents include taste preferences for fast foods (Shepherd, et al., 2006; Kumar, et al., 2016), meal preparation time and effort (Shepherd, et al., 2006; Kumar, et al., 2016), lack of motivation to eat healthy (Kumar, et al., 2016), and physical appearance goals acting as motivation to eat healthy (Shepherd, et al., 2006; Ashton, et al., 2015).

Similar determinants of healthy eating have been found for athletes, however, athletes have reported some additional factors, such as poor cooking skills for athletes no longer living at home (Heaney, O'Connor, Naughton, & Gifford, 2008). Sport-specific determinants reported by athletes are compensating for increased physical activity with greater food intake, and views related to nutrition for sports performance and sporting culture (Birkenhead & Slater, 2015).

Although the above research helps to create assumptions as to what influences support young male adolescent rugby players to eat healthy, there may be other factors due to differences in culture, food availability and values within New Zealand. Birkenhead and Slater (2015) state that there is more research required to further explore the determinants of food choice of athletes, especially in relation to their actual intake. This study aims to explore the determinants of food choices for adolescent male rugby players in addition to their perceptions of healthy eating.

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1.2 Research Aim and Hypothesis

Aim: To explore the perceptions and determinants of healthy eating in high performing adolescent male rugby players living in Auckland, New Zealand.

Hypothesis:

We hypothesize that adolescent male rugby player's perceptions of healthy eating will reflect the healthy eating guidelines in New Zealand and determinants of healthy eating for these participants will include aspects of their home, school and sporting environments.

1.3 Structure of the Thesis

Chapter One: Introduction

Chapter One identifies the importance of the research by providing a background and justification for the research, outlining the aim, objectives and hypothesis.

Chapter Two: Literature Review

Chapter Two explores the literature relating to what is considered healthy eating, perceptions and determinants of healthy eating in general and for adolescents and athletes, and the eating practices of New Zealand adolescents, rugby players and adolescent rugby players including supplement intakes of adolescent rugby players.

Chapter Three: Research Study Manuscript

Chapter Three is a complete presentation of the research study on the perceptions and determinants of healthy eating for high performing male adolescent rugby players living in Auckland, New Zealand. It includes an introduction to the scope and justification of the study, followed by the methodological procedures, results, discussion exploring the results, strength and limitations of the study and conclusion of findings.

Chapter Four: Conclusion and Recommendations

Chapter Four concludes the thesis by providing an overview of the achievement of the aims and objectives, the impact of the research study, strengths and limitations of the research study and final recommendations.

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1.4 Researchers' Contributions

Table 1.1 Researchers contributions to this study

Researchers	Contributions to the Thesis
Emily Stokes	Application for ethics, led the study, developed the interview questions, conducted the interviews, transcribed the interviews, explored the interviews for themes, statistical analysis of the Athlete Diet Index data, interpretation of results.
Dr Kathryn Beck	Academic supervisor and assistance/guidance of: application for ethics, research design, methods and protocols, thesis revision and approval.
Dr Roger Hughes	Academic supervisor and assistance/guidance of: research design, methods and protocols, and research study manuscript revision.
Dave Shaw	Involved in the research design and coordinated participant recruitment.
Associate Professor Helen O'Connor	Involved in the research design.

Chapter Two: Literature Review

This literature review will explore the current research on healthy eating including definitions on what healthy eating is, perceptions of healthy eating in adolescents and athletes; facilitators and barriers to healthy eating in adolescents and athletes, nutrition practices of adolescents living in New Zealand, and rugby players (both adult and adolescent) and supplement intakes of adolescent rugby players. Male adolescent rugby players were chosen as the target group due to the influence of food choices in later adulthood in which an adequate diet will help to maintain health, minimise injury, improve sporting performance and reduce the risk of numerous lifestyle diseases (Lake, Mathers, Rugg-Gunn, & Adamson, 2006; Yeh, et al., 2008; Meyer, O'Connor, & Shirreffs, 2007; Alaunyte, Perry, & Aubrey, 2015). Therefore, understanding the determinants of healthy eating for young male rugby players will help sports dietitians, nutritionists and coaches to understand how best to facilitate their healthy eating practices to optimise their sports performance.

2.1 Healthy Eating

2.1.1 What is considered healthy eating?

The concept of healthy eating, although explained in different ways, includes objectives, principles and certain foods that are aimed at benefiting people's health. At the basic level, healthy eating aims to improve and maintain health (Taylor, Evers, & McKenna, 2005). These objectives of a healthy diet are expressed in a recent global definition by the World Health Organisation (2015) to protect against malnutrition, non-communicable diseases, balance energy intake and energy expenditure, and limit salt and sugar. These principles set out by the World Health Organisation (2015) are the basis for specific healthy eating guidelines by the Ministry of Health in New Zealand (2015), which includes focusing on a variety of foods from the four main food groups, including fruit and vegetables, grains, milk and milk products, and lean meat, poultry, fish, shellfish, eggs, legumes, nuts and seeds. Overall, these guidelines for healthy eating encompass a diet that meets energy requirements, maintains health, focuses on a variety of foods from the four main food groups and limits processed foods high in sugar, fat and salt.

Healthy eating from a young age is important due to the impact of adequate nutrition on growth, cognition, physical development, and its potential influence on healthy eating habits later in

adulthood (Ministry of Health, 2012). Young people have different nutrient needs to adults, such as higher energy needs due to higher basal metabolic rates and additional growth requirements, therefore, healthy eating advice should be specific for adolescents (Cavadini, Decarli, Grin, Narring, & Michaud, 2000). Healthy eating guidelines specific to New Zealand adolescents include consuming three main meals and snacks if needed, preparing foods in a way that is low in fat, sugar and salt, and drinking water for hydration (Ministry of Health, 2012). Requirements should further be altered for adolescent athletes due to greater energy expenditure during exercise which can differ in intensity and duration (Cavadini, Decarli, Grin, Narring, & Michaud, 2000). Adolescent rugby players' nutrition requirements are unique to the physical demands of rugby, including requirements to maintain hydration, sufficient energy levels and factors of timing and types of meals for optimal sports performance (Petrie, Stover, & Horswill, 2004).

2.1.2 Perceptions of healthy eating

The message of healthy eating can be delivered through various aspects of the environment, such as school, media outlets, friends and family, which all can shape views of what healthy eating is. Perceptions of healthy eating in adolescents abroad and in New Zealand and athletes are explored in the following paragraphs.

2.1.3 Adolescents' perceptions of healthy eating

International studies have identified stark differences among adolescent perceptions of healthy eating. Most perceived fruit and vegetables to be associated with healthy eating (Kumar, et al., 2016; Sylvestsky, et al., 2013; Croll, Neumark-Sztainer, & Story, 2001; Brown, Shaibu, Maruapula, Malete, & Compher, 2015; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007; Correa, et al., 2017; Fitzgerald, Heary, Nixon, & Kelly, 2010; Payan, Sloane, Illum, Farris, & Lewis, 2017; O'Dea, 2003). However, apart from this consensus, perceptions of healthy eating varied considerably across studies from a regional and national context. For American adolescents, foods such as rice, bread, lean meat and tofu were considered healthy (Croll, Neumark-Sztainer, & Story, 2001). Foods high in fibre, vitamins and minerals were reported by adolescents living in India and Canada to be associated with healthy eating, with rural Indian adolescents also mentioning contaminant-free food (Correa, et al., 2017). Studies exploring the perceptions of healthy eating of adolescents living in Ireland found adolescents consider wholegrain cereals, the right amount of carbohydrates and fat (Fitzgerald, Heary, Nixon, & Kelly, 2010), seafood and unprocessed meat to be healthy (Stevenson,

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Doherty, Barnett, Muldoon, & Trew, 2007). Foods considered part of a healthy diet by Australian adolescents and children were mainly juice, pasta, rice, milk and cheese, with less common foods mentioned as healthy being bread, cereals, meat, chicken and water (O'Dea, 2003). Studies based in New Zealand, using dietary habits questionnaires and surveys, reported adolescents' perception of healthy eating incorporated fruits and vegetables (Clinical Trials Research Unit, Synovate, 2010; Puloka, Utter, Denny, & Fleming, 2017).

In addition to specific foods, adolescents also associate various other attributes with healthy eating. Key attributes include balance, variety and moderation (Croll, Neumark-Sztainer, & Story, 2001; Toral, Conti, & Slater, 2009; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007; Correa, et al., 2017). Cultural attributes also determine what adolescents regard as healthy food; for instance, whether the food is regarded as natural (Kumar, et al., 2016; Croll, Neumark-Sztainer, & Story, 2001) or familiar (Brown & Ogden, 2004). One cultural attribute which is particularly influential is the association with the home; whether home-made (Correa, et al., 2017) or even eaten at home (Shepherd, et al., 2006; Kumar, et al., 2016). Two attributes, smaller portions and eating at home, were specifically mentioned by adolescents who participated in sports (Kumar, et al., 2016). Cultural attributes mentioned by New Zealand adolescents include bringing lunch from home and eating with family (Puloka, Utter, Denny, & Fleming, 2017; Clinical Trials Research Unit, Synovate, 2010).

Studies investigating adolescent perceptions of healthy eating have also considered what adolescents perceive an unhealthy diet to be. Adolescents from overseas perceived an unhealthy diet to be associated with fast foods, foods high in fat and sugar, soda and weight gain (Shepherd, et al., 2006; Kumar, et al., 2016; Sylvetsky, et al., 2013; Croll, Neumark-Sztainer, & Story, 2001; Brown, Shaibu, Maruapula, Malete, & Compher, 2015; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007). American adolescents living in Kansas have described baked food, red meat and chicken with skin on as unhealthy (Croll, Neumark-Sztainer, & Story, 2001). Eating behaviours linked to unhealthy eating by American adolescents included large portions and over-eating of vending machine snacks (Kumar, et al., 2016).

Perceptions of an unhealthy diet appear to be similar for New Zealand adolescents, with common foods mentioned being those high in fat and sugar and fast foods (Puloka, Utter, Denny, & Fleming, 2017). Additional factors of healthy eating such as not buying takeaways, drinking water and limiting fat and sugar intakes were more frequently mentioned by older adolescents aged 15 to 19 years than younger adolescents aged 10 to 14 years in New Zealand (Clinical Trials Research Unit, Synovate, 2010). This suggests that older adolescents in New Zealand are more likely to have greater understanding of what healthy eating means.

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Benefits of healthy eating mentioned by New Zealand adolescents, were having energy, more control in life, feeling more relaxed and 'good' along with physical benefits of maintaining a healthy weight and looking better (Clinical Trials Research Unit, Synovate, 2010). Other health-related benefits mentioned were reduced sickness, increased recovery, living longer, and improved heart health (Clinical Trials Research Unit, Synovate, 2010). Better performance in school and sport were other benefits of healthy eating reported by New Zealand adolescents (Clinical Trials Research Unit, Synovate, 2010). Sports performance was most commonly mentioned by adolescents aged 10 to 14 years (Clinical Trials Research Unit, Synovate, 2010). Better mental health was also a positive perception of healthy eating by New Zealand adolescents (Kulkarni, Swinburn, & Utter, 2015). These findings suggest adolescents in New Zealand understand the impact of healthy eating on not only their present health, but their health later in life.

While there are some differences, the overall perception of healthy and unhealthy diets is similar abroad and in New Zealand. Typical foods considered healthy are fruits and vegetables, whilst unhealthy foods are those high in fat and sugar.

2.1.4 Athletes' perceptions of healthy eating

Few studies have explored athletes' perceptions of healthy eating. In a study by Heaney, O'Connor, Naughton, and Gifford (2008), focus groups were used to explore healthy eating perceptions of 46 elite athletes between the ages of 16 and 45 years. These athletes thought a healthy diet included a variety of foods from the major food groups and was balanced (Heaney, O'Connor, Naughton, & Gifford, 2008). An unhealthy diet was classified as one high in fat, leading to weight gain, fatigue and poor performance (Heaney, O'Connor, Naughton, & Gifford, 2008). Using interviews, male collegiate football players have reported a healthy diet incorporates foods lower in fat, avoiding high-fat foods, choosing foods high in protein and adequate carbohydrates (Long, Perry, Unruh, Lewis, & Stanek-Krogstrand, 2011). Male hockey players, who took part in interviews, perceive a healthy diet also being low in fat along with being low in sugar, making them feel energised and good, and does not slow them down nor make them feel sluggish in hockey games (Smart & Bisogni, 2001). Perceptions of unhealthy foods by these hockey players included burgers, fries and other fried foods high in fat and sweet foods such as cake, ice-cream and cookies (Smart & Bisogni, 2001). These studies show the link athletes make between perceptions of healthy and unhealthy diets and sports performance.

Although these studies provide an insight into how athletes perceive healthy eating, few studies have explored this. In addition, these few studies are all based abroad and do not include all athlete

types, such as athletes of a different age or sport. Adolescent rugby players living in New Zealand are exposed a different environment and culture which is likely to shape their views on healthy eating.

2.2 Facilitators and Barriers to Healthy Eating

Determinants of healthy eating can be classified as factors of macro-level environments, physical environments, social environment and individual factors as represented in the ecological framework in Figure 2.1 (Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). These determinants of healthy eating in general are explored below.

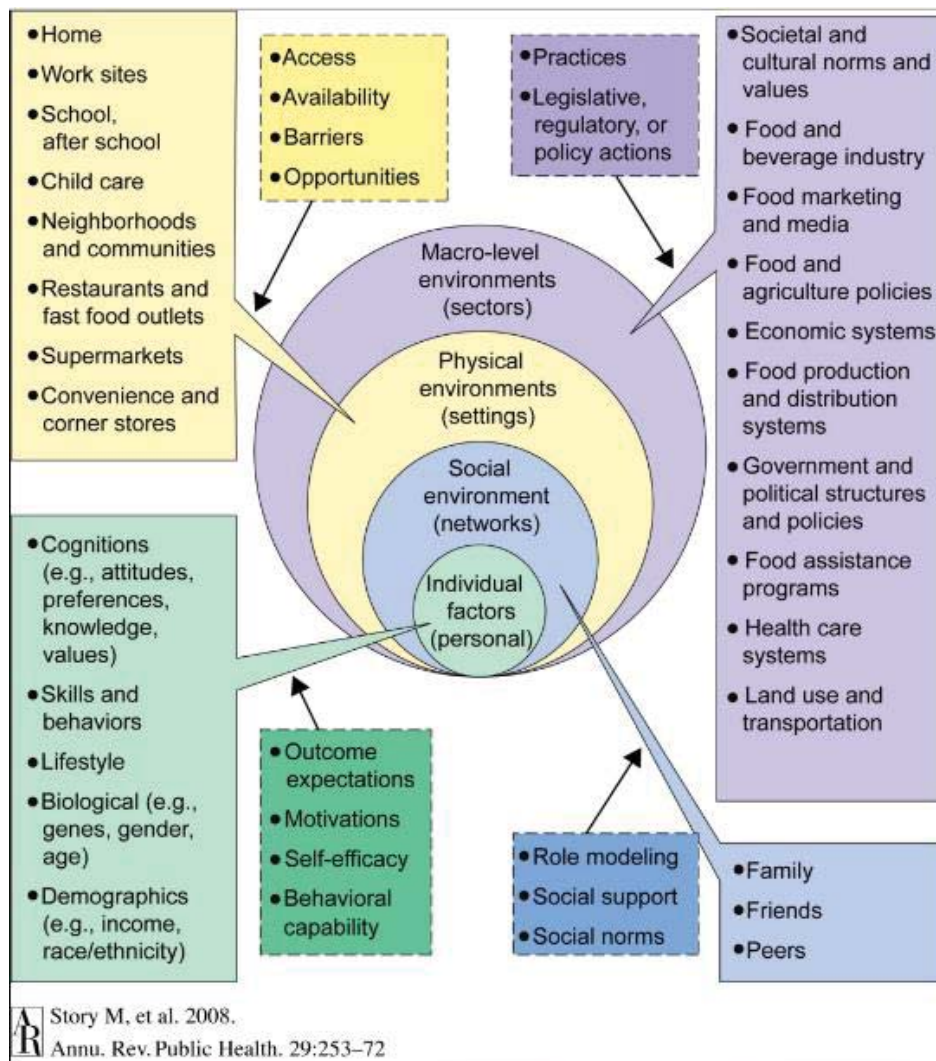


Figure 2.1 Ecological Model showing the determinants of eating behaviour (Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008)

Macro-level environments

On a population level, policies created in government can impact healthy eating by altering food choices. Typical mechanisms used are taxation and restrictions on the advertising of certain foods (Raine, 2005). In addition to government policy, economic factors affect food choices. One New Zealand study, found that healthier foods, lower in fat, sugar and salt, were more expensive than unhealthy alternatives (Wang, et al., 2010). The government also produces dietary recommendations for the public, therefore, are influential to what the public are recommended to eat (Mikkelsen, 2005).

Culture has an important influence on eating practices, such as how one prepares their food and taste preferences, but since globalisation many cultural food practices are now interconnected (Taylor, Evers, & McKenna, 2005). In a study by Willows (2005), culture was a determinant of food choice for many Aboriginal children living in Canada, who preferred traditional food. However, consumption of traditional foods tended to decrease with younger generations, suggesting knowledge about preparing traditional food being lost from generation to generation (Willows, 2005). It has been reported that food can encompass a feeling of belonging within a community leading to norms and values placed on food (Raine, 2005).

The media exposes different food groups to the wider public, including young people, therefore, what the media decides to advertise to young people may influence what they find enticing to eat (Taylor, Evers, & McKenna, 2005). It has been reported that food advertising can override familial factors in food choices which is of concern when most food advertised is energy-dense and nutrient-poor (Taylor, Evers, & McKenna, 2005).

Physical environments

The physical environment includes the immediate surroundings, such as the neighbourhood area, which can influence the type of food available. In a New Zealand study, based in the Waikato region, it was found that healthier food tended to be more accessible and available in the urban rather than rural areas (Wang, et al., 2010). The proximity of fast food outlets to one's living environment may be a barrier to healthy eating as food accessibility can influence food choice. In New Zealand, fast food outlets have been found to be located closer to more deprived neighbourhoods, in contrast, outlets such as supermarkets, selling healthy food were found in greater proximity to the least deprived neighbourhoods (Pearce, Blakely, Witten, & Bartie, 2007). Having healthy food less accessible may influence food choices negatively due to easier access and greater availability of unhealthy food within the living environment.

Social environment

Family and parents are also influential to healthy eating, with close links found between parent and child dietary intakes (Raine, 2005; Oliveria, et al., 1992). Parents may influence healthy eating of the family by role modelling, providing food at home and whether they support healthy eating (Taylor, Evers, & McKenna, 2005). An association between parent and children's eating behaviours has been found along with the influence of different parental styles, such as controlling parental behaviour leading to increased consumption of unhealthy foods and body discontent in children (Brown & Ogden, 2004). This is supported by Raine (2005), stating that family can influence how their child views their body who may change their diet to compensate. Therefore, ideal parental methods may be to have a positive stance on healthy eating, not be passive nor too controlling, and linking food with health not behaviour (Brown & Ogden, 2004). Also, a significant correlation has been found between fruit and vegetable availability at home and consumption of fruit and vegetables, however, taste preference can sometimes override availability (Taylor, Evers, & McKenna, 2005; Raine, 2005).

Differences in the importance of factors such as convenience, cost and sensory appeal when making food choices has been found in people living in different countries (Prescott, Young, O'Neill, Yau, & Stevens, 2002). Even within the same culture, people may value traditional food differently depending on what their individual priorities are (Birkenhead & Slater, 2015). For example, those watching their weight may avoid traditional foods or only eat such food on special occasions if these foods are perceived as unhealthy (Pieniak, Verbeke, Vanhonacker, Guerrero, & Hersleth, 2009).

Individual factors

Economic determinants include personal income, socio-economic status, education level, occupation and cost of food (Taylor, Evers, & McKenna, 2005). Inadequate income has been reported as a major barrier to healthy eating (Raine, 2005). In a study by Willows (2005), food insecurity, ranging from anxiety to hunger, was common amongst Aboriginal Canadian families, making purchasing of nutritionally adequate food difficult (Willows, 2005). Food prices have been linked to food choices as shown in the Coronary Artery Risk Development in Young Adults (CARDIA) study in which an increase in the cost of pizza and soda led to a decreased energy intake of participants (Duffey, Gordon-Larsen, & Shikany, 2009). Therefore, the least expensive option is more likely to be chosen, especially if money available to purchase food is low. This presents a barrier to healthy eating if the least expensive option is an unhealthy food (Taylor, Evers, & McKenna, 2005).

Level of education can also impact eating practices in regard to knowing which foods are the healthy choices, with an association observed between lack of knowledge and obesity (Lappalainen, Saba,

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Holm, Mykkanen, & Gibney, 1997). It has also been reported that higher education is linked with greater value placed on nutrition (Steptoe & Wardle, 1999).

Occupation status not only impacts the household income but the availability of food in the household (Taylor, Evers, & McKenna, 2005). Maternal occupation status has been associated with less frequent family meals which can impact the family's healthy eating practices (Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003). Therefore, adolescents with parents that work long hours may consume more convenience foods that require minimum preparation, such as takeaways.

The taste of food has been reported as an important determinant of food choice (Glanz, Basil, Maiback, Goldberg, & Snyder, 1998; Clark J. E., 1998). The importance of taste has been a factor in food choice since infancy, where babies have reported accepting sweet food and turning down bitter food (Clark J. E., 1998). The importance of taste on food choice can be impacted by demographics such as age, gender, income, weight and health which can all impact on food choices made depending on which factor is prioritised (Furst, Connors, Bisogni, Sobal, & Falk, 2001). For example, those with lower incomes or financial constraints will take into consideration the cost as well as the taste of the food when making food choices (Furst, Connors, Bisogni, Sobal, & Falk, 2001).

2.2.1 Facilitators and barriers to healthy eating for adolescents

A number of studies have focussed on facilitators and barriers to healthy eating in adolescents. Facilitators for adolescents to eat healthy include adequate availability and access to healthy food (Shepherd, et al., 2006; Raine, 2005), motivation (Ashton, et al., 2015), family and social support (Shepherd, et al., 2006; Ashton, et al., 2015). Barriers to healthy eating for adolescents reported include lack of healthy food available at school (Shepherd, et al., 2006; Kumar, et al., 2016) and immediate surroundings (Kumar, et al., 2016; Correa, et al., 2017; Payan, Sloane, Illum, Farris, & Lewis, 2017), preference for fast food (Shepherd, et al., 2006; Kumar, et al., 2016; Citozi, Bozo, & Pano, 2013; Payan, Sloane, Illum, Farris, & Lewis, 2017; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007; O'Dea, 2003), lack of nutrition knowledge (Citozi, Bozo, & Pano, 2013), media (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007), food used as a reward (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007; O'Dea, 2003), peer-pressure (Kumar, et al., 2016; O'Dea, 2003), the masculine stereotype (Ashton, et al., 2015), lower cost and convenience of unhealthy food (Shepherd, et al., 2006; Correa, et al., 2017). These facilitators and barriers to healthy eating for adolescents can further be classified into factors of macro-level environments, physical

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environments, social environment and individual factors as represented in the ecological framework in Figure 2.1 (Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008).

Macro-level environments

The economic environment includes how foods are advertised. Many advertisements for unhealthy foods target young people, thereby influencing their food choices (Raine, 2005). This is supported in a study by Taylor, Evers, and McKenna (2005) who reported media sources, such as television, act as a barrier to healthy eating for youth. This is also found to be the case for Australian and Irish adolescents who report media advertisements act as a deterrent to healthy eating due to unhealthy food advertised in an appealing way (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007; O'Dea, 2003). However, media was also found to be a source of motivation for Irish adolescents to eat healthy due to encouraging thinness as an attractive physical quality (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007). Media is cited as having potential influence not only by tempting adolescents to choose foods advertised and eat healthy in order to maintain the body ideals, but can also influence adolescents' food preferences, purchases, nutrition knowledge, attitudes toward food, and eating practices (Taylor, Evers, & McKenna, 2005).

Social and cultural norms developed in society may influence stereotypes around healthy eating. For example, the masculine stereotype, defined by Horrocks (1994) as being the provider, strong and physically capable, conflicting with healthy eating has been reported in Australian males aged 18 to 25 years (Ashton, et al., 2015).

Physical environments

The physical environment includes the school environment and immediate surroundings (Taylor, Evers, & McKenna, 2005). Schools are considered as a good setting to promote healthy eating to young people (Neumark-Sztainer, Martin, & Story, 2000; Briggs, Safaii, & Beall, 2003). The school environment has the potential to influence adolescents' eating practices through food availability, school food policies, nutrition education, and role modelling of teachers and peers (Taylor, Evers, & McKenna, 2005). Food policies in schools and health education have been associated with changes in students' nutrition knowledge and eating practices (Keirle & Thomas, 2000; Luepker, et al., 1996), therefore, having a potential positive influence on young people's healthy eating.

In a study based on African-American and Latino adolescents living in America, school meals were an important source of healthy food, providing options such as salads, sandwiches and fruit (Payan, Sloane, Illum, Farris, & Lewis, 2017). In a study in Kansas, USA, sixth to eighth graders reported unavailability of healthy food in their school lunches, vending machines, and grocery stores being

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inaccessible to their families as barriers to healthy eating (Kumar, et al., 2016). A systematic review in adolescents 11 to 16 years reported a lack of healthy options available at school and teachers not supporting healthy eating as a barrier to healthy eating (Shepherd, et al., 2006). However, improved availability of healthy food at school was mentioned as a facilitator to healthy eating (Shepherd, et al., 2006). Food available to adolescents in general, whether at school or not, has an impact on food choice with availability of food, such as fruit and vegetables, potentially increasing consumption of these at home (Resnicow, et al., 1997; Baranowski, et al., 1993; Hearn, et al., 1998). These studies suggest that adolescents are likely to be impacted by their physical environment as this influences food accessible to them.

In a study based in New Zealand with participants aged 15 to 18 years and mostly New Zealand/European ethnicity, it was reported that boys in schools with more food choice options in the immediate environment surrounding the school had a better diet quality whilst proximity to food outlets for girls had a negative impact on their diet quality (Clark, et al., 2014). In another New Zealand study on Pasifika youth, participants would shop and travel for food in areas that had cheaper or familiar food (Tupai-Firestone, et al., 2016). This suggests that although immediate surrounds may have an impact, some youth will still travel to get the food they desire.

Social environment

Family and friends have been shown to be either a facilitator or barrier to healthy eating depending on whether or not they are supportive of healthy eating, as they dictate the perceived norms of eating (Shepherd, et al., 2006; Raine, 2005) and are a source of healthy eating advice (Sylvetsky, et al., 2013; Kumar, et al., 2016). In a study by Pedersen, Gronhoj and Thogersen (2015), adolescents reported that parents had a greater influence on food choice than friends when it came to healthy eating. It has been reported that food provided by the family becomes familiar to adolescents through repeated exposure, therefore, having a potential influence on food choice (Contento, Williams, Michela, & Franklin, 2006). When food available at home is healthy, it has been reported to be an enabler of adolescent healthy eating practices (Loth, MacLehose, Larson, Berge, & Neumark-Sztainer, 2016; Brown, Shaibu, Maruapula, Maleté, & Compher, 2015; Payan, Sloane, Illum, Farris, & Lewis, 2017).

Support, encouragement and unity to eat healthily from parents is a common facilitator for healthy eating for adolescents and young people (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007; Shepherd, et al., 2006; Ashton, et al., 2015; Kalavana, Maes, & de Gucht, 2010). Parental control was mentioned as an enabler of healthy eating by Irish adolescents as parents restricted the availability of unhealthy food options at home (Fitzgerald, Heary, Nixon, & Kelly, 2010). This was also found in a

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study on American adolescents with a mean age of 14 years completing surveys, where food restriction was positively correlated with fruit and vegetable consumption (Loth, MacLehose, Larson, Berge, & Neumark-Sztainer, 2016). A lack of parental control has shown to potentially hinder adolescents' self-efficacy toward healthy eating (Kumar, et al., 2016). Adolescents also perceive parents as a barrier to healthy eating when they brought, ate, and prepared unhealthy food, therefore, not role modelling healthy eating, and adolescents feeling like they have no choice but to eat the same food (Bech-Larsen & Kazbare, 2014; Fitzgerald, Heary, Nixon, & Kelly, 2010; O'Dea, 2003). Parents are role models to healthy eating behaviour for adolescents with parents' role modelling unhealthy eating behaviour associated with unhealthy eating practices by adolescents (Loth, MacLehose, Larson, Berge, & Neumark-Sztainer, 2016). A longitudinal study undertaken on American adolescents from 12 years (first year of the study) to 17 years (final year of the study), found parental dietary intakes influenced the intakes of these participants in the final year of the study suggesting a long-term impact of parental role modelling (Arcan, et al., 2007).

Cost and convenience influences foods purchased by the family, with some families having a low income, working long hours or having hectic schedules (Kumar, et al., 2016). Canadian adolescents have reported that when parents of adolescents work long hours this results in a lack of time to prepare meals for the family, which made adolescents feel they needed to purchase store-brought food (Correa, et al., 2017). For the families in the study by Kumar, Adhikari, Lindshield, Muturi and Kidd (2016), grocery stores were not close which meant perishable foods such as fresh fruit and vegetables were less likely to be purchased. Overall, the cost and convenience of food appears to be an important determinant of food choice for younger people and their families (Kumar, et al., 2016; Correa, et al., 2017).

Lack of support from peers around healthy eating has also been reported as a barrier to healthy eating by adolescents (Bech-Larsen & Kazbare, 2014). Adolescents in the United Kingdom have reported friends being the least helpful when making dietary changes and tended to associate unhealthy food with pleasure and friends (Shepherd, et al., 2006). Peer pressure to eat unhealthy has been reported in American and English adolescents and young Australians when eating out, potentially due to wanting social acceptance (Kumar, et al., 2016; Ashton, et al., 2015; Brown & Ogden, 2004; Brown, Shaibu, Maruapula, Malette, & Compher, 2015; Kalavana, Maes, & de Gucht, 2010; O'Dea, 2003). Whereas, peer approval to eat healthy has also been mentioned as a facilitator to healthy eating (Kalavana, Maes, & de Gucht, 2010).

Unhealthy food provided as a reward by peers, teachers and on social occasions has been reported by adolescents as a barrier to healthy eating (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007;

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O'Dea, 2003). Social occasions have been linked to feeling relaxed and indulgent, therefore, influencing adolescents to choose unhealthy food (Bech-Larsen & Kazbare, 2014). Adolescents have also reported using unhealthy food to uplift mood and pass time when bored (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007; O'Dea, 2003).

Individual factors

Motivation has been reported as a facilitator to healthy eating, with key motivating factors for young people including living longer, looking good and improving fitness and health (Ashton, et al., 2015; Shepherd, et al., 2006). It has also been suggested by researchers that not wanting to be overweight may influence adolescents to limit their intake of unhealthy food (Shepherd, et al., 2006). Lack of motivation to eat healthy has been reported as a barrier to healthy eating by African-American and Latino adolescents from low-income families (Payan, Sloane, Illum, Farris, & Lewis, 2017). These adolescents also reported low-quality, less desirable food available in their community which may be a reason for difficulty sourcing good quality healthy food (Payan, Sloane, Illum, Farris, & Lewis, 2017).

Nutritional knowledge may act as a determinant of healthy eating. It has been reported that adolescents view a lack of nutritional knowledge, not understanding what they can do to improve their diet and teachers not providing sufficient nutrition education as barriers to healthy eating (Shepherd, et al., 2006; Citozi, Bozo, & Pano, 2013). For adolescents living in Albania, good nutritional knowledge was an enabler to healthy eating, likely due to understanding what they should be eating (Citozi, Bozo, & Pano, 2013). Although it has been shown that nutrition knowledge for adolescents is generally low, especially in understanding the association between food intake and health, nutrition knowledge has not been consistently and positively linked with healthy eating behaviour (Taylor, Evers, & McKenna, 2005).

Food preference has been reported as a determinant to healthy eating for adolescents. A study on American adolescents found a positive association between food preferences for fruit and vegetables and intake (Arcan, et al., 2007). However, numerous studies have shown that adolescents have a preference for the taste, smell and appearance of fast foods (Citozi, Bozo, & Pano, 2013; Shepherd, et al., 2006; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007; Fitzgerald, Heary, Nixon, & Kelly, 2010; Payan, Sloane, Illum, Farris, & Lewis, 2017; O'Dea, 2003). In a study exploring healthy eating perceptions of Irish adolescents, participants thought healthy foods, such as green vegetables, tasted bland (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007). In addition, South African adolescents have reported the traditional food of Botswana, considered healthy, as not tasting good and considered these foods unappealing (Brown, Shaibu, Maruapula, Maletle, &

Compher, 2015). Dislike for healthy food due to the perception of it tasting bad was also a trend for young male Americans, aged 9 to 14 years, whilst young females were more likely to have a positive outlook on healthy food (Sylvetsky, et al., 2013). However, due to this study being based on younger adolescents aged 9 to 14 years, they may not represent older adolescent's perceptions on healthy eating.

Sensory appeal in which taste, appearance and smell is involved, is a main motivating factor in food choice, with a greater influence than nutritional knowledge (Kumar, et al., 2016; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007). Since the taste preference for fast food by adolescents appears common this is of concern as the sensory appeal overrides nutrition knowledge.

Although, adolescents typically eat with family and friends and both have been shown to influence food choice, autonomy is also valued by this age group (Contento, Williams, Michela, & Franklin, 2006; Kumar, et al., 2016). A systematic review on adolescents showed the importance of autonomy with adolescents valuing the ability to make their own food choices (Shepherd, et al., 2006). In a study on adolescents living in Ireland, when adolescents had more autonomy to purchase foods and weakened parental control, they would most likely buy unhealthy food options (Fitzgerald, Heary, Nixon, & Kelly, 2010). Therefore, autonomy whilst valued by adolescents, may give them greater access to unhealthy foods. Adolescents have reported using strategies to maintain their autonomy. In an American study on adolescents aged 11 to 18 years, participants would use strategies in order to choose healthier food options at home, such as making their own meal, having what their family has or negotiating with parents (Contento, Williams, Michela, & Franklin, 2006). When eating with peers a strategy used was to eat with peers who ate similar food, which if eating healthy would be an enabler to healthy eating (Contento, Williams, Michela, & Franklin, 2006).

Since some adolescents may buy food away from home the price and convenience of food options may impact on food choices. Adolescents have reported low income (Kumar, et al., 2016; Taylor, Evers, & McKenna, 2005) and the lower cost and convenience of unhealthy food options as barriers to healthy eating (Kumar, et al., 2016; Shepherd, et al., 2006; Taylor, Evers, & McKenna, 2005; Fitzgerald, Heary, Nixon, & Kelly, 2010; O'Dea, 2003). In a study by Payan, Sloane, Illum, Farris and Lewis (2017), adolescents perceived fruit and vegetables as more expensive than unhealthy foods. In a systematic review, adolescents thought that reducing the price of healthy food would help them to eat healthy (Shepherd, et al., 2006). South African adolescents have reported that the time, skills and effort required to prepare healthy food was a barrier for eating healthy food whilst junk food is easy and convenient since it is pre-prepared (Brown, Shaibu, Maruapula, Maletle, & Compher, 2015).

2.2.2 Facilitators and barriers to healthy eating for athletes

Few studies have investigated facilitators or barriers to healthy eating for athletes, especially for adolescent athletes. Only one study has specifically addressed this topic of facilitators and barriers to healthy eating for athletes, exploring this for elite male and female athletes, aged 16 to 45 years, from an Australian State Institute of Sport, using focus groups (Heaney, O'Connor, Naughton, & Gifford, 2008). Barriers reported for athletes were lack of time and access to appropriate food for sport, concerns regarding poor cooking skills by younger athletes, the cost of food for those transitioning into adulthood and moving out of the family home (Heaney, O'Connor, Naughton, & Gifford, 2008). Having nutritional knowledge was a facilitator to healthy eating due to greater confidence (Heaney, O'Connor, Naughton, & Gifford, 2008).

In a review article investigating factors influencing athlete's food choices, but also that of general populations due to limited research specific to athletes, barriers to healthy eating included taste preferences, hedonic hunger, 'off-season' in sport, and compensating for increased energy expenditure with greater food intake (Birkenhead & Slater, 2015). This review article found that enablers to healthy food choices for athletes included higher income and education, nutrition knowledge, belief that nutrition is important for sports performance, physique goals, and family support (Birkenhead & Slater, 2015). These determinants are explored in greater depth below and are classified as macro-level, physical and social environments and individual factors according to the ecological framework in Figure 2.1 (Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008).

Macro-level environment

Culture may be an important influence of food choice for athletes (Birkenhead & Slater, 2015). Athletes from different countries may have different cultures, religions, traditions and values which could influence their food choices (Birkenhead & Slater, 2015; Pelly, O'Connor, Denyer, & Caterson, 2009; Ono, Kennedy, Reeves, & Cronin, 2012). For athletes that follow a religion, this religion may impact their food choice, for example, during Ramadan for Muslims (Burke & King, 2012). Athletes migrating into a new country and sports team may not eat the local foods of their team mates, due to negative perceptions of the food and different cultural up-bringing (Ono, Kennedy, Reeves, & Cronin, 2012). Sporting culture may also be a determinant of food choice, including the traditions and beliefs within a sporting culture, as shown in a study reporting that nutrition was not valued for participants in the English football culture (Ono, Kennedy, Reeves, & Cronin, 2012).

Physical environment

Where athletes live may influence food availability and accessibility, for example, hockey players living in university residence have reported, in interviews, greater amounts of food available at meal-times in the dining halls, influencing players to over-eat in freshman year as the setting was similar to a buffet (Smart & Bisogni, 2001). However, after their first year in University, the quantity of food available did not lead athletes to over-eat due to the buffet-style dining hall no longer perceived as overwhelming (Smart & Bisogni, 2001).

Social environment

Family is an important determinant of healthy eating, for example, male hockey players have noted the important influence family had on eating practices prior to college due to parents having control of food available in the household (Smart & Bisogni, 2001). These hockey players also reported that some eating behaviours were acquired by that of their parents, for example having less meat due to their mother being a vegetarian (Smart & Bisogni, 2001).

Team mates have the potential to influence the food choices of athletes. Obtaining a social image may influence athletes' food choices, such as wanting to comply with team mates and eat food which is socially acceptable (Hackman, Katra, & Geertsen, 1992). In interviews, male collegiate football players have reported team mates influencing their eating behaviour, for example, if their team mates were eating healthy this would inspire them to eat healthy also (Long, Perry, Unruh, Lewis, & Stanek-Krogstrand, 2011). Male hockey players have also reported team mates influencing what they eat, copying their team mates' actions (Smart & Bisogni, 2001). Older members of sports team have been reported as role models to younger players who looked up to them, asking older team mates for nutrition advice and observing what they eat (Long, Perry, Unruh, Lewis, & Stanek-Krogstrand, 2011; Smart & Bisogni, 2001).

Individual factors

In a systematic review article by Noll, de Mendonca, de Souza Rosa and Silveira (2017), demographics, such as age and gender, have been found as inconclusive to determining nutrient intakes for athletes. Interestingly, this review article also suggested that athletes did not alter nutritional intakes to different types of training sessions (Noll, de Mendonca, de Souza Rosa, & Silveira, 2017). A study on male adolescent soccer players found these athletes did not change their macronutrient intakes during a four-day period with training ranging from heavy sessions to resting days (Briggs, et al., 2015). Another study on adolescent female judo athletes found differences in fat and carbohydrate intakes across three weeks training, with intakes of these macronutrients

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decreasing during the final week leading up to competition (Boisseau, Vera-Perez, & Poortmans, 2005). Adolescent rugby players' dietary intakes were measured during a control (inactive) session, rugby session and exercise (cycling) session (Thivel, et al., 2015). Energy and macronutrient intakes varied between sessions, for example, lower fat intakes were reported during lunch time for the control session whilst energy intake was higher after the rugby session compared to the control session (Thivel, et al., 2015).

Time constraints and convenience have been reported as factors in food choice for athletes, due to hectic schedules, lack of time and wanting food preparation to be easy (Heaney, O'Connor, Naughton, & Gifford, 2008; Robins & Hetherington, 2005; Long, Perry, Unruh, Lewis, & Stanek-Krogstrand, 2011; Smart & Bisogni, 2001). Australian elite athletes have reported spending up to 20 hours a week training, in which they also have work or school and travel to sporting events (Heaney, O'Connor, Naughton, & Gifford, 2008). Travelling to training was especially an issue for these Australian athletes who lived far from the training grounds or travelled through heavy traffic (Heaney, O'Connor, Naughton, & Gifford, 2008). Busy schedules equated to less time to prepare and cook meals, often leading these athletes to purchase convenience foods high in fat and sugar (Heaney, O'Connor, Naughton, & Gifford, 2008). Non-elite triathletes have also reported busy training schedules, influencing them to have small frequent meals that are convenient due to decreased leisure time and appetite from exercise (Robins & Hetherington, 2005). Male collegiate football perceived healthy meals as more time-consuming, influencing them to choose convenience foods such as microwavable foods, packaged food, and ready-to-eat foods (Long, Perry, Unruh, Lewis, & Stanek-Krogstrand, 2011).

Poor income can be an issue, such as for those who had recently moved away from home, perhaps due to learning how to budget for food and rent (Heaney, O'Connor, Naughton, & Gifford, 2008). Male collegiate football players reported being responsible for purchasing their own food with value for money an important factor, for example, choosing canned instead of fresh fruit and vegetables as canned was perceived as more cost-efficient (Long, Perry, Unruh, Lewis, & Stanek-Krogstrand, 2011). Elite and professional athletes who train full-time have reported financial constraints as an issue to eating healthily (Hanton, Fletcher, & Coughlan, 2005), whilst for those that work full-time and play sport, cost may be less of an issue (Arnott, 2008). Moving away from home typically means cooking your own food. Younger athletes have reported greater concern about a lack of cooking skills than older athletes who have more experience, being more assured of their cooking ability (Heaney, O'Connor, Naughton, & Gifford, 2008). However, some athletes may be provided food if living in a hostel setting. Athletes in college who are provided meals, although being pre-prepared, may not be provided with food which meets their sporting needs (Heaney, O'Connor, Naughton, &

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Gifford, 2008). As adolescents are typically provided with food from their parents, cooking skills and learning to budget are less likely to be an issue.

Taste is another determinant of healthy eating in athletes. Male hockey players have reported taste conflicting with healthy eating as foods perceived as tasting good included fast foods and sweets (Smart & Bisogni, 2001). Although taste is an important factor when making food choices, for the athlete, it may become a less important factor in upcoming games as foods that are beneficial to sports performance are rated higher (Smart & Bisogni, 2001; Lamont, Kennelly, & Wilson, 2012).

Although, sports performance has been reported by athletes as an important determinant of food choice (Smart & Bisogni, 2001; Long, Perry, Unruh, Lewis, & Stanek-Krogstrand, 2011; Robins & Hetherington, 2005), this may change during off-season (Smart & Bisogni, 2001; Robins & Hetherington, 2005). Male ice-hockey players, reported eating mainly healthy during hockey season with unhealthy foods used as a treat food, then indulging more in eating unhealthy food during off-season (Smart & Bisogni, 2001). Swedish athletes competing in wrestling, judo and taekwondo explained, that preferred food was avoided to meet their required weight (Pettersson, Pipping Eckstrom, & Berg, 2012). The relationship between preferred taste and food and its influence on athlete's performance goals requires further investigation (Birkenhead & Slater, 2015). Hedonic hunger is an appetite for food that tastes good, similar to a craving, but this appetite is not for a specific food, rather pleasurable foods in general (Lowe & Butryn, 2007). Hedonic hunger may be more influential to athletes who compensate for increased energy expenditure from exercise with increased food intake (Birkenhead & Slater, 2015; Lamont, Kennelly, & Wilson, 2012). The impact of hedonic hunger for athletes may also be influenced by sporting goals (Birkenhead & Slater, 2015).

For athletes, such as rugby players, the impact of exercise on appetite may influence healthy eating practices. There is conflicting evidence on whether exercise increases or suppresses appetite with factors of intensity, duration and weather to consider (Birkenhead & Slater, 2015). Some research indicates appetite may increase when exercising in colder temperatures (White, Dressendorfer, Holland, McCoy, & Ferguson, 2005) and decrease when exercising in hot climates (Shorten, Wallman, & Guelfi, 2009). Therefore, athletes playing in the cold may be exposed to stimulated appetite after playing, potentially impacting food choices. Whereas, if athletes are training in hot climates, they may not be hungry post-training, impacting their refuelling strategies. However, the impact of hunger on dietary intake in athletes has not been studied in great depth (Birkenhead & Slater, 2015) with one study's findings implying that exercise has no impact on energy intake for healthy, non-athletic males (Deighton, Barry, Connon, & Stensel, 2013). Furthermore, athletes may

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ignore hunger cues or restrict intake for sport-specific weight goals (Pettersson, Pipping Eckstrom, & Berg, 2012).

Upper-gastrointestinal complaints have been reported by half of recreational athletes within a study by Worme *et al.* (1990). These gastrointestinal disturbances included bloating and abdominal complaints which researchers suggested would lead athletes to modify their diet as a preventative measure against gastrointestinal disturbances (Worme, et al., 1990). Potential modifications outlined by researchers were athletes decreasing the amount of food eaten prior to competition and having meals many hours before competition (Worme, et al., 1990). Athletes modifying their dietary practices with the intention of gastrointestinal disturbances prevention is supported in a study on non-elite triathletes aged 24 to 34 years (Robins & Hetherington, 2005). Modifications by triathletes included timing of food which depended on the type of and time of day the training was (Robins & Hetherington, 2005). An example regarding the type of training was not eating before swimming, but eating during cycling (Robins & Hetherington, 2005). Other responses to timing of food intake included eating a couple of hours prior to training, not just before training to let food settle before exercising (Robins & Hetherington, 2005). Some participants stated not eating before training at all and going without food to prevent gastrointestinal disturbances (Robins & Hetherington, 2005).

A positive body image can help with self-esteem and positively influence a healthy lifestyle for athletes (Hackman, Katra, & Geertsen, 1992). In contrast, body dissatisfaction has been related to increased risk of unhealthy eating behaviours, such as food restriction and eating disorders, in young female athletes from aesthetic sports (Fortes, Neves, Filgueiras, Almeida, & Ferreira, 2013; Anderson & Petrie, 2012; Lipetz & Kruse, 2000; Hackman, Katra, & Geertsen, 1992) and male and female triathletes (DeBate, Wethington, & Sargent, 2002). Athletes may be susceptible to pressure to attain a lean athletic body image (Smart & Bisogni, 2001; Hackman, Katra, & Geertsen, 1992), particularly in sports with importance placed on lean bodies and low body mass (Rodriguez, Di Marco, & Langley, 2009; Byrne & McLean, 2002; Lipetz & Kruse, 2000). Athletes have also reported trying to modify their body composition to enhance sports performance (O'Connor, Olds, & Maughan, 2007; Hackman, Katra, & Geertsen, 1992). Some male hockey players have reported having a strict low-fat diet as they believed this would enhance their sports performance (Smart & Bisogni, 2001). These hockey players also placed importance on body image due to the perception that athletes should have muscles and look fit, in which some players would eat healthy to maintain or lose weight (Smart & Bisogni, 2001). Therefore, body dissatisfaction, physique and sports performance have the potential to influence eating practices in athletes.

Nutrition knowledge may correlate to how confident athletes feel about having a diet that meets their sporting needs, therefore acting as a determinant of food choices (Heaney, O'Connor, Naughton, & Gifford, 2008; Birkenhead & Slater, 2015). Athletes who were more confident in their nutrition knowledge reported greater self-efficacy in applying this to adequate dietary choices for their sport (Heaney, O'Connor, Naughton, & Gifford, 2008). However, nutrition knowledge does not always correlate to eating practices. A systematic review in athletes found a weak ($r < .44$) positive association between nutrition knowledge and dietary practices for athletes in five out of nine studies (Heaney, O'Connor, Michael, Gifford, & Naughton, 2011). Since this systematic review was undertaken, two studies have investigated the nutritional knowledge of rugby players specifically (Alaunyte, Perry, & Aubrey, 2015; Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). Although research on rugby players does not always investigate the link between nutrition knowledge and eating practices, it provides insight into the level of rugby players' nutrition understanding which has been linked as a weak, but potential, determinant of eating behaviour with some research suggesting it may play a minor but important role in the development of healthy eating habits (Worsley, 2002; Velazquez, Pasch, Ranjit, Mirchandani, & Hoelscher, 2011).

A study based on elite male rugby players in the English Super League, aged between 18 to 34 years, found general nutrition knowledge to be adequate for these participants, however, lacking in relation to starchy and fibrous food recommendations (Alaunyte, Perry, & Aubrey, 2015). Most participants were unaware of current carbohydrate recommendations and players with poor nutrition knowledge only sometimes ate carbohydrate-rich/fibrous foods (Alaunyte, Perry, & Aubrey, 2015). Participants who had good nutrition knowledge had better fruit and vegetable consumption, however, nutrition knowledge did not translate into other aspects of healthy eating, such as consuming low-fat dairy, wholegrains, and limiting discretionary foods (Alaunyte, Perry, & Aubrey, 2015). The mean nutrition knowledge score for the rugby players was 73% (Alaunyte, Perry, & Aubrey, 2015). In comparison, a study on elite Australian athletes aged between 18 to 20 years, including rugby players, found a nutrition knowledge score of 58% regarding knowledge of dietary recommendations (Spronk, Heaney, Prvan, & O'Connor, 2015). Although the nutrition knowledge assessment tools between studies differed, differences in scores between the studies may be due to a higher level of education and older age in the English rugby players.

Athletes, including male rugby players, aged 15 to 20 years have shown good knowledge in relation to hydration (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011; Spronk, Heaney, Prvan, & O'Connor, 2015). However, young male senior schoolboy rugby players competing in Ireland, aged 15 to 18 years, have shown to lack understanding of specifics around sports drinks, that is, to consume sports drinks if exercising more than an hour (Walsh, Cartwright, Corish, Sugrue, & Wood-

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Martin, 2011). Furthermore, knowledge on protein appears to be lacking in young athletes and rugby players (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011; Spronk, Heaney, Prvan, & O'Connor, 2015). For example, less than half of senior schoolboy rugby players knew the muscles' main source of energy is not protein, but carbohydrates (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). Overall, these players had relatively poor nutritional knowledge in terms of appropriate foods for post-match refuelling, correct use of sports drinks, and the role of protein in gaining muscle mass (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). In addition, the young rugby players' nutritional knowledge did reflect in their eating practices. For example, over half the players who knew they should be eating something straight after exercising in fact did (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). These findings highlight that nutritional knowledge is variant for rugby players, potentially influenced by age and experience.

2.3 Nutrition Practices

To date, no studies appear to have specifically investigated determinants of healthy eating in young rugby players. However, a number of studies have investigated the nutrition practices of rugby players. There is however, limited research into the nutrition practices of adolescent rugby players. This section therefore focuses on the eating practices of adolescents living in New Zealand, rugby players and adolescent rugby players.

2.3.1 Nutrition practices of adolescents living in New Zealand

In the New Zealand Health Survey Annual Update of Key Results 2013/14, it was reported nine out of ten children eat breakfast every day, however, children aged 10 to 14 years were less like to eat breakfast than those aged under 10 years (Ministry of Health, 2014). Māori and Pacific children were less likely to eat breakfast at home every day than non-Māori and non-Pacific children (Ministry of Health, 2014). Children living in the most deprived area were also less likely to eat breakfast at home every day (Ministry of Health, 2014). Hazardous drinking habits were highest in young people aged 18-24 years, although, this has improved since the 2006/07 survey (Ministry of Health, 2014). As these findings are based in New Zealand, they may be reflected in young New Zealand rugby players, however, the results of the survey are not specific to athletes.

In a National Survey of Children and Young People's (aged 5 to 24 years) Physical Activity and Dietary Behaviours in New Zealand undertaken in 2008/09, it was found that more children and young people met the guidelines for fruit than vegetable intakes, with only 32% meeting recommendations

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for both fruit and vegetable intakes, and this decreased with age (Clinical Trials Research Unit, Synovate, 2010). Nearly all ate bread daily, half choosing wholegrain or wholemeal options (Clinical Trials Research Unit, Synovate, 2010). Most participants consumed junk food no more than twice a week (Clinical Trials Research Unit, Synovate, 2010). Consumption of fast food seven or more times a week increased with age whilst intake of snack foods decreased with age (Clinical Trials Research Unit, Synovate, 2010). Water and milk were commonly consumed, however, drinking milk decreased with age (Clinical Trials Research Unit, Synovate, 2010). Soft drinks were consumed by approximately half of participants at least once a week, and soft drinks being consumed seven or more times a week increased with age (Clinical Trials Research Unit, Synovate, 2010). In a study by Kulkarni, Swinburn and Utter (2015), on New Zealanders aged 12 to 20 years, younger participants were more likely to eat healthier than the older participants. These findings suggest that New Zealand youth have poorer dietary intakes as they get older with unhealthy habits more likely in later adolescence.

The 2008/09 New Zealand Adult Nutrition Survey (NZANS) assessed dietary intake for New Zealanders, including adolescents aged 15 to 18 years. The main foods contributing to energy intake for all age groups was bread, followed by grains, pasta, potatoes, kumara and taro (University of Otago and Ministry of Health, 2011). Most adolescents met the Acceptable Macronutrient Distribution Range (AMDR) for protein (15-25% of total energy intake), with mean protein intakes of 16% and 15.2% of total energy intake for adolescent males and females respectively (University of Otago and Ministry of Health, 2011). Although total fat intake was within recommendations, mean saturated fat intakes of adolescents was greater than the recommended 10% of total energy intake (University of Otago and Ministry of Health, 2011). Carbohydrate intakes of adolescents were within New Zealand recommendations (45-65% of total energy intake) with bread being the biggest contributor to carbohydrate intake (University of Otago and Ministry of Health, 2011). The prevalence of inadequate iron intakes for those aged 15 to 18 years was 34.2% with a median intake of 13.5mg/day for males and 9.1mg/day for females (University of Otago and Ministry of Health, 2011).

Dietary habits were also reported in the NZANS, with over half (55.4%) of adolescent males and 44.5% of females having breakfast daily (University of Otago and Ministry of Health, 2011). Those meeting the recommended three or more servings of vegetables a day was 50.9% and 61.5% of adolescent males and females aged respectively (University of Otago and Ministry of Health, 2011). Those consuming two or more servings of fruit a day were 61.2% and 65% of male and female adolescents respectively (University of Otago and Ministry of Health, 2011). Wholegrain bread varieties were chosen most of the time by 43.8% and 46.7% of adolescent males and females respectively and reduced-fat or trim milk was chosen most of the time by 33.4% and 38.9% of

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adolescent male and females respectively (University of Otago and Ministry of Health, 2011). Soft drinks were consumed three or more days a week by 52.5% and 39.6% of adolescent males and females respectively and fast food was consumed three or more times a week by 14.4% and 17.2% of adolescent males and females respectively (University of Otago and Ministry of Health, 2011). Those reporting choosing wholegrain bread and reduced-fat milk was lower in participants living in higher neighbourhood deprivation, whilst intakes of soft drinks were greater in those living in neighbourhoods of high deprivation (University of Otago and Ministry of Health, 2011).

Healthy eating has been reported more frequently for younger students, those with European or Asian ethnicities, and those living without poverty in New Zealand (Puloka, Utter, Denny, & Fleming, 2017; Kulkarni, Swinburn, & Utter, 2015). In contrast, unhealthy eating has been more frequently reported in students with Māori or Pacific ethnicity and those living in high deprivation or with poverty (Puloka, Utter, Denny, & Fleming, 2017; Kulkarni, Swinburn, & Utter, 2015). It has also been shown in adolescents from Otago aged 14-18 years, that fitter adolescents had healthier diets than those who were less fit, for example, fitter adolescents consumed more fruit, vegetables and less treat foods (Howe, et al., 2015). Adolescent rugby players are potentially fitter than adolescents who do not play sport, and this may have an influence on their dietary intakes.

2.3.2 Nutrition practices of rugby players and adolescent rugby players

Rugby players

A study by Alaunyte, Perry, & Aubrey (2015) investigated the nutritional knowledge, using general nutrition knowledge questionnaires, and eating habits, using food frequency questionnaires, of professional English rugby players. Participants were grouped into those with good nutritional knowledge versus poor nutritional knowledge. They found those with good nutrition knowledge consumed greater amounts of fibre-rich and carbohydrate-rich foods (Alaunyte, Perry, & Aubrey, 2015). However, participants only consumed carbohydrate-rich foods sometimes, except for breakfast cereals which were consumed most days (Alaunyte, Perry, & Aubrey, 2015). It should be noted that the mean age was 25 years (age range of 18 to 34 years), therefore, these participants are likely to have greater nutritional knowledge than adolescents due to greater experience and exposure to nutrition advice, potentially influencing food choice (Alaunyte, Perry, & Aubrey, 2015).

Japanese rugby players, with a mean age of 20 years, were studied regarding their eating practices using food frequency questionnaires (Imamura, et al., 2013). These players also had lower than required carbohydrate intakes, and intakes of vegetables, protein, magnesium, vitamins A, B1, B2,

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and C were all lower than Japanese recommendations (Imamura, et al., 2013). Participants did however have adequate intakes of dairy food (Imamura, et al., 2013). Overall, these Japanese rugby players had inadequate nutrient intakes, suggesting a poor-quality diet.

In comparison, a study looking at food diaries of 14 elite European rugby union players, aged 21 to 34 years, found micronutrient intakes were adequate and current eating practices were sufficient to fuel their training during in-season (Bradley, et al., 2015). There were differences in energy intake within a week leading up to game day, energy expenditure exceeded energy intake at the start of the training week which reversed towards the end of the week leading up to game day, whereby energy intake exceeded energy expenditure (Bradley, et al., 2015). Researchers noted that this was likely due to tapered training and increased carbohydrate intakes towards the end of the week (Bradley, et al., 2015).

A study by Tooley, Briggs, West, and Russell (2015) assessed dietary intakes using self-reported diet sheets of ten male rugby league players (mean age of 23 years) competing in the United Kingdom. Overall, findings included players having inadequate fibre and micronutrient intakes and adequate protein intakes (Tooley, Bitcon, Briggs, West, & Russell, 2015). Timing during the competitive week influenced players' fat intake which was greater during the two-day post-match recovery time, potentially related to unhealthy eating practices (Tooley, Bitcon, Briggs, West, & Russell, 2015).

Food diaries were analysed for four days from 34 professional rugby league players (mean age of 25 years) competing in Australia (Lundy, O'Connor, Pelly, & Caterson, 2006). Analysis showed mean intakes of carbohydrates being 52%, protein 18% and fat 25% of total energy intake (Lundy, O'Connor, Pelly, & Caterson, 2006). Although fat intake was considered low, almost half was from saturated fat (Lundy, O'Connor, Pelly, & Caterson, 2006). Fibre intake was high, mostly from pasta, bread, cereal and potatoes (Lundy, O'Connor, Pelly, & Caterson, 2006). Most micronutrient intakes met the recommended dietary intake with iron intakes high, main sources were meat and iron-fortified breakfast cereal (Lundy, O'Connor, Pelly, & Caterson, 2006).

To conclude, the dietary intake of adult rugby players varies across different countries with some studies showing adequate nutrient intake and others showing nutrient intakes below recommendations. Whilst these studies, especially our neighbouring nation Australia, help to provide potential insight into the dietary intakes for adolescent New Zealand rugby players, the food available within New Zealand differs. Also, methods used to assess dietary intake vary including food frequency questionnaires and food diaries which are both self-reported, potentially impacting the validity of responses.

Adolescent rugby players

A study based in Ireland on 203 male rugby players aged 15 to 18 years, using a questionnaire designed specifically for the study to examine nutrition behaviours, found about one quarter of the participants ate something before a match or training session, with almost all consuming carbohydrate-rich foods and most consuming protein-rich foods pre-training (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). After a match or training session, over half of participants consumed food within 30 minutes, with 86% consuming carbohydrate-rich foods and 92% consuming protein-rich foods (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). Some participants consumed sports drinks pre-exercise and during exercise with almost half consuming sports drinks post-exercise (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). Almost all participants consumed water during exercise, however, amounts of water consumed were not measured (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011).

Under-age drinking was found to be high in these young Irish rugby players, with 82% of those under the age of 18 years drinking alcohol, however, the amount and frequency of alcohol consumption was not measured (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). Peers may influence alcohol consumption, with rugby players wanting to follow what those around them are doing or drinking as a means to relieve emotional stress (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011).

Another study, based in Australia, investigated the diet quality of 25 competitive male adolescent rugby union players aged 14 to 18 years (Burrows, Harries, Williams, Lum, & Callister, 2016). Diet was assessed using the validated Australian Eating Survey (AES) food frequency questionnaire, and diet quality was assessed using the Australian Recommended Food Score (Burrows, Harries, Williams, Lum, & Callister, 2016). Researchers found that participants' diet was good but lacked variety in the protein and carbohydrate food groups (Burrows, Harries, Williams, Lum, & Callister, 2016). These adolescent rugby union players had energy intakes within recommendations based on their sporting needs and adequate intakes of fruit, protein, total fat, calcium, fibre, and iron (Burrows, Harries, Williams, Lum, & Callister, 2016). Areas lacking included excessive intake of fast food and sweetened beverages, greater than recommended saturated fat intakes, and inadequate intake of dairy foods, vegetables and carbohydrates (Burrows, Harries, Williams, Lum, & Callister, 2016).

A study based in England looked investigated the eating practices during the pre-season training period of elite 14 to 19-year-old male rugby players (Smith, Jones, Sutton, King, & Duckworth, 2016). Diets were reported using 4-day diet diaries and compared to adolescent sport nutrition

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recommendations and the UK national food guide (Smith, Jones, Sutton, King, & Duckworth, 2016). Researchers found participants grouped as the under 19s (mean age of 18 years) had a better-quality diet with greater fruit and vegetable intakes and less fat and sugar intakes than the under 16s (mean age of 15 years), however, intakes of fatty and sugary foods were still greater than recommended (Smith, Jones, Sutton, King, & Duckworth, 2016). All participants met their energy, carbohydrate, fat and fluid requirements and the under 16s (mean age of 15 years) met their protein requirements whilst the under 19s (mean age of 18 years) exceeded protein recommendations (Smith, Jones, Sutton, King, & Duckworth, 2016). In addition, researchers suggested that if the players' goal was to increase muscle mass, they may have required more energy intake to accomplish this (Smith, Jones, Sutton, King, & Duckworth, 2016).

These findings suggest relatively poor nutrition practices of young rugby players, such as players not consuming carbohydrates pre-exercise, drinking alcohol, and having high intakes of fast food and sweetened beverages.

2.4 Adolescent Rugby Players' Supplement Use

Supplement use is a concern among adolescent athletes (Desbrow, et al., 2014). In a study on adolescent Irish male rugby players aged 15 to 18 years, 64.5% of participants took a dietary supplement, 43.8% used protein supplements, 28.6% used creatine, 28.6% used vitamin and mineral supplements, 7.5% used herbal supplements and 35.5% thought that micronutrient needs could not be met through diet alone (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011) Researchers suggested that protein supplements were the most common supplement due to rugby players perceptions of increased muscle mass being a requirement of the sport (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011). The researchers' findings of creatine use among players, especially those under 18 years of age, was mentioned as a "cause for concern" due to the lack of evidence that creatine use is safe for adolescents (Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011).

In an Australian study, supplement use was reported low in competitive adolescent male rugby union players with less than 10% of participants using vitamin supplements (Burrows, Harries, Williams, Lum, & Callister, 2016). The types of supplements and reasons for consumption were not assessed (Burrows, Harries, Williams, Lum, & Callister, 2016). A study on elite English male rugby players, aged 14-19 years, found protein intake increased with age in relation to protein supplement intakes (Smith, Jones, Sutton, King, & Duckworth, 2016). Intakes of other supplements used was not assessed.

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Research on supplement use for rugby players is lacking. Overall, findings from the above studies show variable supplement use by rugby players, however, protein supplements appear to be the most common supplement.

2.5 Conclusion

Existing research has found adolescents' perceptions of healthy eating includes fruit and vegetables with additional foods considered healthy by adolescents differing between and within countries. Athletes have a similar perception of healthy eating as adolescents, with an additional association seen between healthy eating and sporting outcomes. Determinants of healthy eating are complex, incorporating the macro-level environment, physical environment, social environment and individual factors. Although there is similarity in these factors for adolescents and athletes regarding general lifestyle factors, such as the impact of cost and convenience on food choices, athletes have determinants of healthy eating that are specific to their sporting lifestyles. Therefore, adolescent athletes potentially will incorporate factors of adolescents' lifestyles in general and factors of athlete specific lifestyles. Adolescent athletes in New Zealand are exposed to different economic and physical environments, culture and social norms compared to adolescents based overseas. New Zealand adolescents in general may have different eating behaviours than New Zealand rugby players as sporting ambitions may influence food choices. A direct association between adolescent rugby players based abroad and adolescent rugby players in New Zealand cannot be made due to possible differences in culture and societal norms experienced within different countries.

Although this body of research provides insight into perceptions and determinants of healthy eating, there is research lacking on perceptions and determinants of healthy eating specific to high performing male adolescent rugby players living in New Zealand. It is important to investigate the perceptions and determinants of high-performing young male rugby players in New Zealand as they are our future All Blacks and optimal nutrition will enhance their performance. Understanding how to best support young rugby players in New Zealand to develop healthy eating practices, through overcoming barriers and misconceptions of healthy eating, will help these players to obtain their optimal nutrition needs. Therefore, exploring the perceptions and determinants of healthy eating for high-performing male adolescent rugby players living in New Zealand is the focus of the research study manuscript in Chapter Three.

Chapter Three: Research Study Manuscript

Perceptions and Determinants of Healthy Eating in High Performing Male Adolescent Rugby Players

Abstract

Background: Rugby is a competitive sport in New Zealand, with the leading team, the All Blacks, ranked first in the world. Since nutrition plays an important role in sports performance, understanding how to facilitate young high-performing rugby players to eat healthy will help to optimise their performance. Research is lacking regarding perceptions and determinants of healthy eating for young rugby players, both in New Zealand and internationally. This study aimed to explore perceptions and determinants of healthy eating for high performing male adolescent rugby players living in New Zealand.

Methods: Perceptions and determinants were explored using semi-structural individual interviews. Participants were 20 male high-performing rugby players aged 16 to 18 years. Interviews were recorded and transcribed for thematic analysis of themes.

Results: Perceptions of healthy eating included balance and variety, portions according to energy needs and specific foods. Numerous determinants of healthy eating were described including factors related to the general lifestyle of an adolescent, including peers, family and food availability, cost, convenience and taste of food. Sports-specific determinants relating to participants' athletic lifestyles were sports performance, motivation to perform, team culture and the timing, amount and time of food and effects on the gastrointestinal tract. Some determinants were both general and sports-specific determinants including the media, physical appearance and feeling good.

Conclusion: High-performing male adolescent rugby players living in New Zealand have a good general understanding of the meaning of a healthy diet. A range of determinants influence the diet of these young rugby players, including general and sports-specific determinants from the macro-level, social and physical environment, as well as individual factors. Further research is required to explore the determinants of healthy eating in high-performing male adolescent rugby players both in New Zealand and internationally.

Introduction

Rugby is popular, with 121 countries registered with the International Rugby Board (World Rugby, 2017). Application of evidence-based sports nutrition principles is central for optimising sports performance and supporting growth and lean mass development in adolescent rugby players. Although robust scientific position stands (Desbrow et al., 2014; Thomas et al., 2016), and evidence-based resources exist to guide young players on optimal dietary strategies for optimal sports performance (Alencar & Yaceczko, 2017; Middleton et al., 2003), the dietary intake of adolescent rugby players appears to fall short of these guidelines (Walsh et al., 2011; Burrows et al., 2016). This is also commonly reported in other adolescent sporting groups (Nikić et al., 2014; Iglesias-Gutiérrez et al., 2005). In fact, the diets of adolescent athletes tend to be similar to peers in the general population, typically exhibiting inadequate fruit and vegetable intake, and high intakes of fast and discretionary (treat) foods and sugar-sweetened beverages (Burrows et al., 2016). Although nutrition education may support improved dietary intake in adolescent athletes, knowledge does not always translate into practice (Spronk et al., 2015). Therefore, exploring the motives, enablers, barriers and rationale behind food choice through determinants analysis is a valuable research area for informing a targeted strategy to support improved adherence to sports nutrition recommendations.

There have been numerous studies exploring determinants of healthy eating for adults and adolescents (Citozi, Bozo, & Pano, 2013; Shepherd, et al., 2006; Kumar, et al., 2016; Taylor, Evers, & McKenna, 2005; Willows, 2005; Raine, 2005; Ashton, et al., 2015; Croll, Neumark-Sztainer, & Story, 2001). However, research is lacking in relation to athletes, especially adolescent athletes. Common enablers of healthy eating reported for adolescents outside of New Zealand include nutrition support and information provided from family and friends (Shepherd, et al., 2006) possessing will-power and self-efficacy to eat healthy (Shepherd, et al., 2006; Citozi, Bozo, & Pano, 2013), availability and accessibility of healthy food (Shepherd, et al., 2006; Raine, 2005), and nutrition knowledge (Citozi, Bozo, & Pano, 2013). These enablers are likely to be similar for adolescent athletes with additional sport-specific facilitators such as the importance placed on nutrition for sport and goals relating to physique or altered body composition (Birkenhead & Slater, 2015).

There are numerous barriers influencing healthy eating. For adolescents, barriers include taste preference for fast food (Shepherd, et al., 2006; Citozi, Bozo, & Pano, 2013), peers not encouraging healthy eating (Shepherd, et al., 2006; Kumar, et al., 2016), lower cost of unhealthy foods (Kumar, et al., 2016; Shepherd, et al., 2006), lack of time and energy to prepare healthy meals (Kumar, et al., 2016; Shepherd, et al., 2006), unavailability of healthy food options at school (Kumar, et al., 2016), lack of nutritional knowledge and not understanding how to improve their dietary intake (Citozi,

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Bozo, & Pano, 2013). For athletes a lack of time (Heaney, O'Connor, Naughton, & Gifford, 2008) and cost of food (Heaney, O'Connor, Naughton, & Gifford, 2008; Birkenhead & Slater, 2015) have also been reported as barriers, along with hedonic hunger (Birkenhead & Slater, 2015), taste preferences, off-season in sport, and compensating for increased energy expenditure through greater food intake (Birkenhead & Slater, 2015).

The assumption that high performing adolescent athletes experience the same barriers and enablers to healthy eating as adult athletes and non-athletic adolescents needs testing. Studies exploring determinants of healthy eating are largely based overseas, where there are different economic, social and physical environments compared to New Zealand. Therefore, determinants of healthy eating for male adolescent rugby players living in New Zealand, may differ to determinants explored abroad.

This study aimed to explore perceptions and determinants of healthy eating for high performing male adolescent rugby players living in New Zealand.

Methods

Study design

A cross-sectional mixed methods approach using both quantitative and qualitative research was undertaken. Quantitative data was collected using the Athlete Diet Index (Blair, 2017) which aims to assess athlete adherence to Eating and Activity Guidelines for New Zealanders (Ministry of Health, 2015). Qualitative research aims to understand peoples' perceptions, attitudes, thoughts and emotions of a certain circumstance in an uncontrolled specific setting (Harris, et al., 2009). Ethical approval for this study was granted by the Massey University Human Ethics Committee Northern (reference NOR 16/33).

Participants and recruitment

Male adolescent rugby players were recruited from four secondary schools in Auckland, New Zealand. Schools recruited were Kelston Boy's High School, Dilworth School, St. Peter's College, and Saint Kentigern Boy's School with deciles ranging from three to ten deciles. School deciles indicate the socio-demographic status of that school and the funding it receives from the New Zealand government. The lower the decile number, the more funding the school receives. Eligibility criteria included being male, 16-18 years and playing in the first fifteen rugby team of their high school. Participants were excluded if they were absent at the time of the interviews or were aged <16 years.

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The sporting manager and/or rugby coach from each school was contacted by telephone or email to inform them of the study and gain consent for the study to be conducted. Participants were selected by their coach or sporting manager, with top players from each team chosen to ensure participants were 'high performing' players. All participants provided written consent prior to taking part (see *Appendix A* and *Appendix B* for study information and consent forms) and were given a \$30 petrol voucher for their time. Twenty participants were recruited from four schools, five participants each, as has been reported by qualitative researchers in which twenty participants is an acceptable sample size based on little new information provided after twenty interview transcripts (Green & Thorogood, 2009).

Methodological procedures

All interviews and questionnaires were carried out by a trained female researcher on the school grounds. The interview questions were developed by the research team and finalised as a collective. These methodological procedures are outlined below.

Questionnaires

Participants were asked about demographics (age, ethnicity), self-reported height and weight, current weekly training regime and supplement intake during the last month. The Athlete Diet Index (ADI) was used as a quantitative measure to determine the eating habits of the participants. This questionnaire took the participants approximately 15 to 20 minutes to complete. This questionnaire was available to participants through Survey Monkey. Questions related to the average number of servings consumed for food groups and fluids, as well as the number of times discretionary foods such as takeaways and treat foods were eaten.

Interviews

Participants underwent individual face-to-face, semi-structured interviews as a qualitative measure to explore what they thought a healthy diet was, their personal facilitators and barriers to healthy eating and additional questions on supplement use as shown in Table 1 below. Interviews lasted between 40 to 60 minutes and were recorded on a recording device, with an additional recording device available for back-up. Field notes were also recorded during the interviews.

Table 1. Questions used to promote discussion in the individual interviews

Describe in your own words what you think a healthy diet is
Why do you think this is healthy?
Can you provide some examples of healthy foods?
Describe in your own words what you think an unhealthy diet is
Why do you think this is unhealthy?
Can you provide some examples of unhealthy foods?
What do you think are the benefits of healthy eating?
Why do you think that?
Do these benefits influence what you eat?
What makes it easier for you to eat healthy?
What gets in the way/makes it more difficult for you to eat healthy?
Do you think that what you eat has an influence on how you perform?
No: Why?
Yes: What types of foods do you think have an influence on your rugby playing? Why?
Are there any specific foods, drinks or products that you can take to help your rugby playing?
No: Why?
Yes: How do you think that works? What benefits do they bring?
Is there anything we haven't talked about that affects what you eat?

The interviews were transcribed by the main researcher and three researchers (including the main researcher) explored the findings individually and then as a collective using investigator triangulation to provide cross-verification and strengthen trustworthiness. Thematic analysis was used to explore themes from the transcribed interviews by coding key ideas within the transcripts which were then interpreted and grouped into themes derived from the data.

Statistical Analysis

Participant's identity remained anonymous by providing each participant with code identification to be utilised in reporting results from both the ADI and interview. The ADI findings were analysed in Microsoft Excel 2016 and descriptive statistics presented using mean \pm SD and median (25th - 75th %tile) for continuous data and n (%) for categorical data.

Results

Participant Characteristics

Twenty participants were approached to be interviewed, none declined, and all met the inclusion criteria of being 16-18 years of age. There was no attrition in participant recruitment nor interviews. The mean age of participants was 17 ± 1 years. The mean height, weight and BMI was 182 ± 9 cm, 97 ± 12 kg and 29 ± 5 kg/m² respectively. Ethnicities of participants were 35% New Zealand or European, 35% Samoan, 20% Tongan and 10% Māori. On average, participants trained 14.4 ± 8 hours per week.

Participants were asked if they were on a diet. Fifty-five percent reported following no diet, 20% reported a healthy balanced diet, 5% reported clean eating, 5% reported high fibre, 25% reported high protein, 15% reported low fat, and 10% reported peanut/nut free. Some participants reported multiple diets, for example, being on high protein, peanut and nut free diets. Additional characteristics and dietary intake of participants are shown in Table 2 and Table 3.

As shown in Table 2 below, for most participants the highest representative level was regional (competitive/representative), followed by national, school and international (for age group) levels. Half of the participants stated that they did not take supplements. For participants who took supplements, the most popular supplement was sports drinks, followed by sports bars, vitamin/mineral supplements and protein powder.

Table 2. Characteristics of participants (n=20)

Characteristics	Total: n (%)
Highest representative level	
Regional - competitive/representative	12 (60)
National	2 (10)
International - age group	1 (5)
School	5 (25)
Supplements previous 4 weeks	
No	10 (50)
Sports foods	
Sports drinks	6 (30)
Sports bars	3 (15)
Pre-workout	1 (5)
Protein powder	3 (15)
Medical supplements	
Magnesium	3 (15)
Calcium	4 (20)
Multivitamin/mineral	3 (15)
Vitamin D	2 (10)
Performance supplements^a	
Creatine	1 (5)
AIS Group B categorised supplements^b	
Fish oil	1 (5)

AIS – Australian Institute of Sport

^a Performance supplements - Include caffeine, B alanine, bicarbonate, beetroot juice and creatine as defined by the AIS.

^b AIS Group B categorised supplements - Include polyphenols, antioxidants C & E, carnitine, HMB, glutamine, fish oil and glucosamine. These supplements are classed as Group B based on further research is required to determine the safety, legality and effectiveness in sports performance of these supplements.

As shown in Table 3 below, the majority of participants met EAGNZA recommendations for fruit, lean meat, poultry, fish, other seafood, eggs and meat alternatives, and discretionary food intakes. Vegetables, grains and milk and milk product intakes were below EAGNZA recommendations for most participants.

Table 3. Dietary intake of participants

ADI item	EAGNZA ^a	Number of servings or times eaten (mean±SD)	Number of servings or times eaten (median, 25-75 th %tile)	Proportion (n (%)) meeting EAGNZA
Food groups (servings per day)				
Fruit	≥2	3.09±2.43	3.00 (1.72, 3.25)	15 (75)
Total vegetables	≥3	2.46±2.50	1.21 (0.68, 4.29)	8 (40)
Grain foods	≥6	3.79±2.66	4.00 (1.75, 5.00)	3 (15)
Milk and milk products and/or alternatives	≥3 (≤18y)	2.67±2.56	2.00 (0.93, 4.25)	7 (35)
Lean meat, poultry, fish, other seafood, eggs and/or meat alternatives^b	≥2 (≤18y)	4.10±3.38	3.43 (1.28, 5.20)	14 (70)
Discretionary foods (times per week)^c				
Times eaten treat food	<1	0.54±0.86	0.43 (0.13, 0.47)	18 (90)
Times eaten takeout food	<1	0.16±0.11	0.14 (0.07, 0.25)	20 (100)
SSB^d	NA	1.55±1.58	0.89 (0.49, 1.82)	NA

ADI - Athlete Diet Index, EAGNZA – Eating and Activity Guidelines for New Zealand Adults, SSB - sugar Sweetened Beverages.

^aAdapted for New Zealand adolescents aged under 18 years

^bRecommendation is ≥1 serving of red meat, poultry, fish, other seafood, or eggs or ≥2 servings of legumes, nuts, seeds (meat alternatives)

^cDiscretionary foods – recommendation is to limit these foods

^dSSB - Includes flavoured/sports water, fruit juice, soft drinks, cordials, hot chocolate, energy drinks

Qualitative data

Participants perceptions of a healthy and unhealthy diet

The key themes depicting perceptions of a healthy and unhealthy diet included balance and variety, portions according to energy needs, and specific foods.

Balance and variety

Balance and variety was a key theme highlighted by participants with the most common response for a healthy diet being to eat a variety of foods and to balance portions of carbohydrates, protein and fruit and vegetables in general. An unhealthy diet was commonly viewed as not having balance in regard to macronutrients, for example eating too many carbohydrates.

Portions according to energy needs

Having the 'right amount' of food was associated with a healthy diet. For participants this meant not having too much food, especially before training or a game, and eating small portions.

Specific foods

Foods perceived as healthy by participants were mainly fruit, vegetables, meat (both white and red), eggs, fish, milk and yoghurt. Other common foods mentioned as healthy options were cheese, porridge, wheat biscuits, potatoes, rice, pasta and bread. Water was mentioned as part of a healthy diet and was commonly described in the context of amount consumed with perceptions varying from maintaining adequate intake, drinking to a hydrated state, to drinking a lot.

Protein supplements and sports drinks were also described as contributing to a healthy diet. However, those that mentioned protein supplements thought that in general natural protein in food was better, with a consensus that they are too young to take supplements, and those that mentioned sports drinks highlighted that they can be beneficial if used during exercise, but unhealthy if consumed when not exercising due to the sugar content.

Foods mentioned as unhealthy were takeaway foods such as McDonalds, KFC, pies, pizza, fried food, potato chips, and sweets foods such as cake, chocolate, ice-cream, lollies, and soft drinks.

Reasonings behind perceptions of healthy and unhealthy diets

When asked why participants thought the factors described above were healthy, it was commonly mentioned that these types of food provide energy, and this is what they had been told by nutritionists, coaches, friends, family, team mates, school, or at rugby camps. Media was another influence, i.e. what the internet and television advertise as healthy eating as well as role models,

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typically professional rugby players, who participants followed on the internet. Past experiences also had an impact of their perceptions of a healthy diet, including having a lack of energy with unhealthy eating.

The supplements, protein supplements and sports drinks, were mentioned as benefiting sports performance. Protein supplements were thought to help with muscle strength, gain and recovery, and were a convenient way to increase protein intake. Sports drinks were linked with hydration and energy for sports. Many of the participants had received information on supplements from nutritionists and at rugby camps where they were advised not to take supplements, with the exception being sports drinks.

Foods mentioned as unhealthy were described as being high in fat, sugar and calories, and processed. The unhealthy diet was considered *“not good for the body”*, *“will lead to weight gain”*, *“makes you feel sluggish”* and *“does not help with sports performance”*.

Enablers and Barriers of Healthy Eating

Participants identified numerous barriers and enablers to their food choices and ability to eat healthy. There was substantial overlap between barriers and enablers where factors that helped participants to eat healthy also deterred participants from eating healthy. The main themes from thematic analysis, as depicted in Figure 1, were classed into general, sport-specific, and overlapping of both general and sport-specific determinants.

An illustration of the main themes categorised is shown below in Figure 1. The arrow in Figure 1 represents the flow from general determinants of healthy eating to determinants that overlap as both general and sport-specific, through to sport-specific determinants of healthy eating. General determinants are those that are not specifically related to participants' sporting and athletic lifestyles, whereas, the sport-specific determinants are those that stem from these participants' involvement in sport and the impact this has on their healthy eating practices. Individual determinants of healthy eating, depicted in Figure 1, are either enablers or barriers to healthy eating for participants. Enablers (E), barriers (B), and both enablers and barriers (E+B) are outlined in brackets within Figure 1 for each determinant.

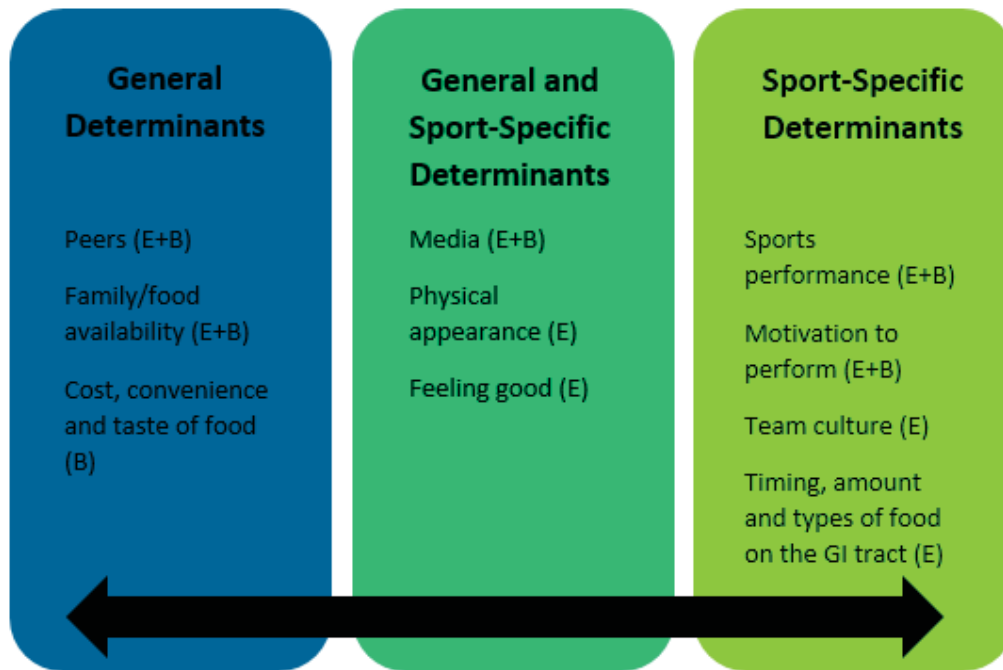


Figure 1. Diagram depicting the main themes of healthy eating as general, sport-specific and overlapping sport-specific and general determinants. E = enabler, B = barrier.

General Determinants

Peers

Peers were commonly discussed by participants as both an enabler and barrier to healthy eating. Peers were enablers when they were supportive of healthy eating and ate healthy themselves, for example, by bringing healthy options for school lunch with many participants stated that they compared their school lunch to their friends' lunch. Participants also stated that their friends would motivate them to eat healthy by telling them to not choose unhealthy foods, with some participants having a competitive edge to healthy eating in their friendship group.

"I guess they kind of motivate me, because for our lunches we try and make a proper meal to put into our lunch box. So, I'm kind of lucky my group's like that and we are quite competitive – always got to have the best lunch." - 50J02

Peers also acted as a barrier to healthy eating when they were eating unhealthy food as this provided temptation to eat unhealthy food also. The peers that tended to eat unhealthy were those that did not play sport or who played social sport, therefore, when around those groups of friends, temptation to eat unhealthily was greater.

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"I have a lot of mates who don't play sport and they bring their own food from home that's pretty unhealthy and yeah it's pretty hard to try and resist that." – 5OJ09

Family and Food Availability

Family were a source of nutrition guidance and food availability to most participants. Family was a positive influence on healthy eating if the parents provided healthy food and family members ate healthily in general. By purchasing, providing and preparing healthy meals, parents tended to make healthy eating more convenient. Parents were considered role models, as one participant put it *"it's monkey see monkey do"*, meaning what participants' parents eat influences their food choices too. Participants stated that their parents and family members acted as motivation to eat healthy, for example, providing reminders that unhealthy food is not good for the body, not to eat excessively or looking up to family members who have played professional rugby.

Family also acted as a barrier to healthy eating if they did not follow or provide healthy food options, making it harder to stick to a healthy diet as this meant that if participants were to have a healthy meal they would need to make it themselves or have a smaller portion. Siblings also made it hard for participants to eat healthily if they were choosing unhealthy options and asking them to join, providing temptation.

"I mean for myself I am probably the one out of my family that is the healthiest. I think that they are not on the same track as me...I have to eat what they are cooking so if it's unhealthy I would try and limit what it is." – 5OJ17

For boarders, their school provided food at certain times of the day. In New Zealand, school boarders are students who live on school grounds and the school provides food. Participants that boarded stated that the food was generally good, but not all food was healthy. Also, timing of meals acted as a barrier as meals were not always available straight before or after trainings. Boarders purchased some of their food in which they had to rely on their will power to purchase healthy instead of unhealthy food.

"I'd say you have to be more responsible because you are the one who has to go down to the place and buy your food. It'd be easier to buy like sugary foods, but I guess you have to be responsible. So, I'd say it makes it harder living up at the house." – 5OJ15

Cost, Convenience and Taste of Food

A common barrier to healthy eating was the taste preference for unhealthy food. Other than the taste of unhealthy foods, the appearance also acted as temptation to eat such foods. Although most

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participants lived at home, the cost of food was still a factor as it influenced the food choices for parents and when participants themselves made food choices outside of home. A common barrier to having healthy meals was the time it takes to prepare healthy meals when energy levels were low, for example after school and training.

“Probably having to make it [healthy food] yourself. Sometimes I am just too tired, and I don’t really want to do it.” -5OJ03

General and Sport-Specific Determinants

Media

Media came up as both an enabler and barrier to healthy eating. The sources of media which were most common were television and the internet including Facebook, YouTube, Instagram and Google. Television programmes, such as the Biggest Loser, and advertisements on Facebook were used as motivation to eat healthy due to the negative outcomes of long-term unhealthy eating shown on these media sources.

“Advertisements like McDonald’s and you compare how much calories and fat there is, and I was just disgusted – you see it on Facebook.” – 5OJ04

It was common for participants to follow their role models on Instagram or YouTube to get inspiration and motivation to eat healthy by seeing what they eat. Google search was used as a source of information on healthy eating.

“I saw um one of the All Blacks has like eggs on toast before a game and stuff like that, so I thought that would be good for you, so I try to have eggs, toast for breakfast on game day and water.” – 5OJ05

“I research what to eat for my specific training like if I am trying to get fitter I search on the kind of foods to eat that would help me...I mostly search on Google and there will be the odd thing that pops up that you see on Facebook.” – 5OJ17

Media was also seen as a barrier to healthy eating when advertisements displayed unhealthy food in an appealing way, creating temptation to eat these foods.

Physical Appearance

Physical appearance was mentioned as a motivating factor to eat healthy in relation to maintaining or losing weight, gaining muscle mass, or just to look good in general whilst eating unhealthily was linked to gaining unwanted weight.

Feeling good

Feeling good mentally and physically was commonly mentioned as a benefit of healthy eating. This was in relation to feeling better about oneself through maintaining the desired physique and meeting fitness goals thereby having a knock-on effect on confidence, happiness and leading to a positive mindset. In comparison, unhealthy eating was associated with the feeling of laziness. In relation to the physical sense, healthy eating was commonly associated with the body feeling good, energised and more able to perform in training and on game day. Feeling good mentally also helped participants to perform better on the field due to feelings of positivity, wakefulness and focus.

Sport-Specific Determinants

Sports Performance

Sports performance was a common benefit of healthy eating mentioned by participants in which energy and muscle mass, recovery and strength were impacted positively by healthy eating. Knowing the benefit healthy eating had on participants' sports performance influenced their food choices, especially around game day. For example, eating carbohydrates the night before or morning of the game for energy. Foods considered as good sources of carbohydrates were pasta, rice, bread and potatoes.

Sugary foods, such as sports drinks and lollies, were often consumed before or during game time to provide an energy boost. Negatives of consuming too much sugar was mentioned in which eating too much sugar leads to a sugar rush followed by an energy crash.

Muscle gain was related to strength on the field, helping with performance. Due to this reason, and the additional benefit of muscle recovery, participants aimed to consume protein foods, especially meat foods. Foods considered to be a source of protein included meat, but also, pasta, rice, fruit and vegetables.

Motivation to Perform

Motivation or lack of it regarding eating healthy for sports performance acted as an enabler and barrier to healthy eating. Motivation was used as a reminder to stay focused and eat healthy, knowing that it would later benefit their rugby performance and help them to accomplish their performance goals.

"I think motivation, sort of where you want to be and what you have to do to get to that stage. Sort of keeps playing over in your head." – 5OJ01

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A lack of motivation to eat healthy was evident when the rugby season was finished or if participants had a sporting injury. When they were not playing rugby either due to injury or the end of rugby season, motivation to eat healthy wavered as they were no longer eating to perform or eating out of boredom.

“An injury is pretty big. So, say if you get a major injury and you’re out from doing running and gym and everything. You’ve kind of got nothing to do. It’s more like, for me I found, oh I’m just going to pass time, so I think that kind of stopped me from my eating healthy plan that I wanted to stick to.” –

5OJ01

Team Culture

Team culture was viewed as an enabler to healthy eating by most. This included their coaches, sports management and team mates. The team culture was a source of healthy eating advice and tips along with encouragement to eat healthy.

“I feel our team culture has been pretty good this year and we all keep each other on track with what we are having. As a team, we all remind each other.” – 5OJ05

The coaches provided healthy tips and encouragement to stay on track with healthy eating and were a source of trusted nutrition advice. Some sports departments also provided participants with healthy food options such as smoothies in the mornings after training. This made having a healthy breakfast before school easier.

Timing, Amount and Types of Food on the GI Tract

The timing, amount and types of food eaten before a game had an impact on how participants’ stomach felt during the game, such as feeling *“sluggish”* and *“weighed down”*. In contrast, eating too little led participants to not having enough energy. Therefore, the timing, amount and type of food was considered on game day when making food choices. It acted as an enabler for choosing healthier food options and appropriate portions that would not upset the stomach during the game.

Unhealthy foods in general were related to poor performance, not providing sufficient energy to last the whole game, and making participants feel lazy and unfit. The types of food mentioned that lead to poor performance due to making participants feel heavy on the field and having a lack of energy were junk foods, for example McDonald’s and chocolate.

Timing of food intake before a game was mentioned by participants with common practice eating two to three hours before a game. Timing of food intake before a game was stated as a factor in participants’ performance by allowing sufficient time for food consumed to digest and settle in the

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stomach before going out and playing rugby. Although this did not influence the type of food chosen before a game it did impact the decision around the portion and timing of food intake.

“Before a game, if I was to eat till I’m full I’d feel heavy, sluggish. I might have energy but yeah, I think if I was to time it. If I had it [meal] right before a game, my body has to have time to digest it like 2-3 hours before” – 5OJ05

Discussion

The findings of this study provide insight into high performing male adolescent rugby players’ perceptions and determinants of healthy eating. As nutrition is such an important component of sports performance through factors of energy, muscle strength and recovery, understanding how to best help young rugby players to eat healthy is likely to ultimately improve their sports performance (Thomas, Erdman, & Burke, 2016). Perceptions of healthy eating included balance and variety, portions according to energy needs and specific foods. Determinants were general, sport-specific and a combination of both general and sport-specific factors.

Participant perceptions of eating for health and performance

Perceptions of healthy eating were generally in accordance with the healthy eating guidelines in New Zealand (Ministry of Health, 2015). The perception of healthy eating was described by participants in terms of balance and variety, portions according to energy needs and specific foods. Balance was described by participants in this study in terms of an even proportion of carbohydrates, protein and fruit and vegetables. In New Zealand, the distribution of these food groups is commonly mentioned as part of a ‘healthy plate model’. As many of these participants attended rugby camps, they would have likely come across this plate model during nutrition talks. Adolescents in other studies based overseas (Correa, et al., 2017; Croll, Neumark-Sztainer, & Story, 2001; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007; Toral, Conti, & Slater, 2009) and Australian athletes (Heaney, O’Connor, Naughton, & Gifford, 2008) have also perceived balance and variety as an important factor within a healthy diet. Male collegiate football players based in the United states, considered a healthy diet as being a diet high in protein, adequate in carbohydrates and low in fat (Long, Perry, Unruh, Lewis, & Stanek-Krogstrand, 2011).

Specific foods mentioned by participants as being healthy were fruit, vegetables, animal foods, dairy products, porridge, wheat biscuits, potatoes, rice, pasta and bread. Fruit and vegetables are generally considered by adolescents as healthy, whilst additional foods perceived as healthy vary (Kumar, et al., 2016; Fitzgerald, Heary, Nixon, & Kelly, 2010; Croll, Neumark-Sztainer, & Story, 2001;

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Payan, Sloane, Illum, Farris, & Lewis, 2017; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007; Sylvetsky, et al., 2013; O'Dea, 2003; Brown, Shaibu, Maruapula, Maleté, & Compher, 2015). This is potentially due to differences in culture and food guidelines within different countries. The foods mentioned as healthy by participants are generally associated with the Eating and Activity Guidelines in New Zealand, however, these guidelines also specify wholegrain breads and cereal and low-fat dairy products, which were not mentioned by participants (Ministry of Health, 2015). This may be due to the question-style in the interviews, with questions focused on foods in general, not specifics such as low-fat versus full-fat dairy. The 'right amount' of food considered as healthy by participants was not quantified, affecting the interpretation of this.

Unhealthy foods commonly mentioned by participants were not unexpected and included junk foods, sugary foods and fizzy. Again, these findings are similar to studies abroad and within New Zealand exploring perceptions of adolescents (Shepherd, et al., 2006; Kumar, et al., 2016; Brown, Shaibu, Maruapula, Maleté, & Compher, 2015; Croll, Neumark-Sztainer, & Story, 2001; Puloka, Utter, Denny, & Fleming, 2017; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007; Sylvetsky, et al., 2013) and athletes (Smart & Bisogni, 2001; Heaney, O'Connor, Naughton, & Gifford, 2008). Australian athletes in a study by Heaney, O'Connor, Naughton and Gifford (2008) perceived an unhealthy diet as being high in fat, leading to weight gain, poor performance and fatigue. Although the participants in this study did not specifically relate an unhealthy diet to poor performance and fatigue, improved sports performance and energy were mentioned as benefits of healthy eating. Male hockey players also mentioned a healthy diet being one that makes them feel energised and not sluggish in hockey (Smart & Bisogni, 2001).

Sports drinks and protein supplements were mentioned as part of a healthy diet, mainly for sports performance reasons. However, participants appeared to have some confusion as to whether or not protein supplements are healthy, for example, natural sources of protein were considered better, but protein supplements were considered a convenient way to gain muscle. It is possible that these athletes do not understand the risks, such as product contamination, associated with taking these supplements, however this was not explored (Whitehouse & Lawlis, 2017). The Sports Dietitians Australia recommendation is that nutrition requirements are met by food rather than supplements (Desbrow et al., 2014). There is limited research on male adolescent rugby players' use of supplements, however, studies have found that 41-44% of adolescent English and Irish rugby players were taking protein supplements (Smith, Jones, Sutton, King, & Duckworth, 2016; Walsh, Cartwright, Corish, Sugrue, & Wood-Martin, 2011).

Determinants of eating for health and performance

Determinants of healthy eating found for these participants related both to their general lifestyles as adolescents and/or to their sporting lifestyles as young rugby players. General determinants of healthy eating were peers, family and food availability, and cost, convenience and taste of food. Determinants overlapping general and sporting lifestyles were media, physical appearance, and feeling good. Sport-specific determinants were sports performance, motivation to perform, team culture; and timing, amount and types of food on the GI tract. These determinants incorporate the macro-level, social, and physical environments as well as individual factors.

Peers were either an enabler or barrier to healthy eating for participants depending whether or not they were supportive of healthy eating. Similar findings have been found in other studies focusing on determinants of healthy eating in young people, where lack of support from peers is a barrier to healthy eating (Bech-Larsen & Kazbare, 2014) and peer approval for healthy eating reported as a facilitator (Kalavana, Maes, & de Gucht, 2010). Adolescents living in Australia have also reported peer pressure to eat unhealthy food (O'Dea, 2003). In this study, peers were not necessarily pressuring participants to eat unhealthily, with the exception of some siblings, however, deterred healthy eating practices through temptation by eating unhealthy food in participants' presence.

Family and food availability are linked as parents purchase food for the family, thereby, determining food available in the household. Family was both a facilitator and barrier to healthy eating for participants. For instance, when parents provided healthy food and role-modelled healthy eating, this helped participants to eat healthy. Adolescents from the USA, have also reported parental role modelling of healthy eating to facilitate their healthy eating behaviours (Loth, MacLehose, Larson, Berge, & Neumark-Sztainer, 2016). Previous research has shown when food available at home is healthy, fruit and vegetable intake increased in adolescents (Loth, MacLehose, Larson, Berge, & Neumark-Sztainer, 2016). Male hockey players have also reported that family influenced their eating practices when they were at home (Smart & Bisogni, 2001). Therefore, family appear influential in the eating practices of adolescents, athletes and adolescent rugby players. Educating peers and family on healthy eating, and how to create supportive environments for healthy eating could be a potential strategy to help adolescent athletes eat healthily.

The time taken to prepare, and the cost of healthy food and meals was a barrier for participants due to lacking energy after school and training and perceiving unhealthy food as the most inexpensive option. Affordability and convenience of food has frequently been reported by adolescents as a determinant of food choice (Fitzgerald, Heary, Nixon, & Kelly, 2010; Taylor, Evers, & McKenna, 2005; Kumar, et al., 2016; Shepherd, et al., 2006; Brown, Shaibu, Maruapula, Maletse, & Compher, 2015;

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Correa, et al., 2017; Croll, Neumark-Sztainer, & Story, 2001; Payan, Sloane, Illum, Farris, & Lewis, 2017; Toral, Conti, & Slater, 2009; O'Dea, 2003). Similar findings have been found for Australian athletes (Heaney, O'Connor, Naughton, & Gifford, 2008). Adolescents living in Australia have reported cost and convenience as a barrier to healthy eating, perceiving unhealthy food to be convenient, easier to prepare and cheaper (O'Dea, 2003). Australian athletes have reported lack of time as a barrier to healthy eating due to lots of travelling and training for sport (Heaney, O'Connor, Naughton, & Gifford, 2008). In Australia, cost of food was reported as a concern for athletes living away from home for the first time, transitioning into young adulthood (Heaney, O'Connor, Naughton, & Gifford, 2008). Male collegiate football players also view healthy meals as more time-consuming to prepare, instead choosing ready-to-eat meals and packaged food (Long, Perry, Unruh, Lewis, & Stanek-Krogstrand, 2011). Cost and convenience of food should be considered when promoting healthy food to these adolescents.

The taste of unhealthy food was appealing for participants. Adolescent taste preference for unhealthy food is widely established in the literature (Shepherd, et al., 2006; Citozi, Bozo, & Pano, 2013; Kumar, et al., 2016; Fitzgerald, Heary, Nixon, & Kelly, 2010; Croll, Neumark-Sztainer, & Story, 2001; Payan, Sloane, Illum, Farris, & Lewis, 2017; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007; Toral, Conti, & Slater, 2009; O'Dea, 2003). Male hockey players have also reported fast foods and sweets as tasting good, and perceived taste as conflicting with healthy eating (Smart & Bisogni, 2001). However, for athletes, sports performance may be more important to them than taste, for example, male ice-hockey players reportedly eating healthy during the sports season then indulging in unhealthy food during off-season (Smart & Bisogni, 2001). Taste appears to be an important factor in food preferences for adolescents and young rugby players, however, athletes also place importance on their sports performance. Ideas for affordable, tasty and easy to prepare healthy foods should be promoted to young athletes, for example suggesting healthy alternatives to fast foods or providing simple healthy recipes for the family.

Media was an important determinant of healthy eating. Participants in this study looked up to professional rugby players, such as the All Blacks, following these players on social media. These professional rugby players were viewed as role models because they were where participants wanted to be, playing professional rugby. These role models influenced participants' food choices as they could see what these professional rugby players ate, inspiring them to eat similar food. Other studies exploring determinants of healthy eating for adolescents have reported media as an influence on food choice, however, this was in relation to advertising in media, not the influence of role models on social media platforms (Taylor, Evers, & McKenna, 2005; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007). Social media use has significantly increased in the past ten years

(Kaplan & Haenlein, 2010) which may explain the difference in findings. The influence of social media on eating practices for participants shows the impact social media has on younger generations. Older members of a male hockey team have reported the younger members looking up to them, asking for nutrition advice (Long, Perry, Unruh, Lewis, & Stanek-Krogstrand, 2011). Therefore, not only professional athletes, but older athletes in general, may be influential to the eating practices of younger athletes, including young rugby players.

Advertisements in media were also a determinant of healthy eating for participants, creating a temptation to eat unhealthy when unhealthy food is advertised in an appealing way or motivator to eat healthy when advertisements were showing the negatives of long-term unhealthy eating. Adolescents in Ireland have reported similar findings of media deterring healthy eating through advertising unhealthy food in an appealing way, thereby, creating temptation to eat such food (Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007). Media is both an enabler and barrier to healthy eating, depending on what is promoted. Ensuring adolescent athletes understand the positives, negatives and marketing associated with media is key to supporting them develop a healthy mind set around food.

Physical appearance was a motivating factor to eat healthy for participants wanting to meet or maintain body composition goals. Athletes living in Australia also linked what they ate to physique, for example, unhealthy eating leading to weight gain (Heaney, O'Connor, Naughton, & Gifford, 2008), however these athletes were female and competing in a range of sports. Ensuring that young athletes have a healthy relationship between body shape and eating is essential in order to make sure that they are eating healthily, not restricting intake, as body dissatisfaction has been linked to an increased risk in disordered eating in athletes (Anderson & Petrie, 2012; Fortes, Neves, Filgueiras, Almeida, & Ferreira, 2013; Lipetz & Kruse, 2000; Hackman, Katra, & Geertsen, 1992; DeBate, Wethington, & Sargent, 2002) and rugby players (Gibson, et al., 2017). Another motivating factor to eat healthy was how healthy eating made participants feel good physically and mentally. The 'feel good factor' of healthy eating has also been reported in adolescents living in Australia, making them feel good, clean and revived (O'Dea, 2003). Feeling good appears to resonate with adolescents as a benefit of healthy eating. The influence healthy eating has on appearance and feeling good could be emphasised in nutrition education sessions as a motivator for eating healthy.

As these participants were young rugby players, it is not surprising that sports performance was a major determinant of healthy eating. Knowing the impact of their food choices on sports performance motivated participants to eat healthy during rugby season. However, during the off-season or if injured, participants were no longer eating to perform, therefore, were tempted to eat

unhealthy during this time. Temptation to eat unhealthy during 'off-season' in sport has also been mentioned by male ice-hockey players aged 18 to 23 years (Smart & Bisogni, 2001). Therefore, a lack of motivation to eat healthy when not performing appears to be not only for young rugby players, but for some young adult athletes too (Smart & Bisogni, 2001). Finding the motivation to eat healthy when young rugby players are not playing rugby is essential for continued healthy eating practices.

Team culture, including coaches, sports management and team mates, were a positive influence for participants, being a source of encouragement to eat healthy and providing nutrition advice. Team mates were stated by male collegiate football players as being a significant influence on their eating behaviour, for example, if their team mates were eating healthy this would potentially make them eat healthily also (Long, Perry, Unruh, Lewis, & Stanek-Krogstrand, 2011). Athletes may follow the eating practices of their team mates due to wanting to comply with what is socially acceptable within the team (Hackman, Katra, & Geertsen, 1992). This shows the impact team culture, especially team mates, can have on athletes and young rugby players' eating practices. As coaches and trainers are a trusted source of nutrition information, it is essential they are educated on healthy eating practices that are safe and in-line with healthy eating guidelines.

The impact of timing, amount and type of food had on the gastrointestinal system influenced participants' food choices around game day. Foods high in fat, and large amounts of food eaten close to game time made participants feel sluggish on the field, therefore, such food choices were avoided. Nutritional factors, such as intakes of fat and fructose, have been reported as a potential cause for gastrointestinal disturbances (Oliveira, Burini, & Jeukendrup, 2014). Athletes have previously reported gastrointestinal discomfort influencing food choices around competition time (Birkenhead & Slater, 2015). Gastrointestinal (GI) disturbances have been reported in American recreational triathletes, with researchers suggesting athletes may use preventative measures in nutrition practices, such as altering the quantity and timing of food consumed (Worme, et al., 1990). Gastrointestinal disturbance may influence what young rugby players choose to eat around competition time, therefore, individual strategies to overcome GI disturbances whilst provide sufficient energy should be developed for individual athletes, potentially through trial and error methods. Adolescents should be encouraged to have appropriate food choices available on game day to maximise their sporting performance.

Study strengths and limitations

This study had a number of strengths and limitations which must be considered when interpreting the results. Participants were from schools with deciles ranging from 3-10, representing a range of socio-demographic backgrounds. Māori and Pacific Island ethnicities in the study were well

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represented with 65% of participants being either Pacific Island or Māori ethnicity. This range of views is key for New Zealand public health research to incorporate in order to reduce health inequalities in research outcomes. Schools recruited however, were from the Auckland region only, in which there are Auckland rugby camps and sports nutritionists available. This limits the generalisability of results to the wider New Zealand regions, especially those regions without nutrition talks available to rugby players.

The advantage of undertaking individual interviews with participants excludes the potential of peer influence which may occur with focus groups for this age group, therefore, participants may have felt more comfortable expressing their views. However, the individual interviews were not anonymous as participants were talking to one researcher in which they may not have been completely honest in order to please the interviewer and meet perceived expectations assumed (Krumpal, 2013). This was evident when the researcher asked participants about their views of supplements in sport in which almost all participants initially said 'no', but when probed, supplements did arise. Furthermore, participants may have been more comfortable with an interviewer of their own gender, rather than a female interviewer, which was the case in this study. As investigator triangulation was used in the analysis of interview responses, this method provides greater truthfulness and credibility to findings due to the cross-verification process used to explore and articulate themes, which arose from participants' perceptions.

While not a main objective of the study, dietary intakes were self-reported and retrospective, therefore, actual intakes may differ with potential for inaccuracies reported (Gemming, Jiang, Swinburn, Utter, & Mhurchu, 2014; Schoeller, 1995). This may be the case for intakes of discretionary foods which participants are aware as perceived unhealthy, therefore, may have under-reported their intakes of these foods. The study found participants' diets were lacking in vegetables, grains and dairy whilst high in meat foods. Participants' low intakes of vegetables, grains, and dairy products conflicts with their views of vegetables, carbohydrates, and milk and milk products in a healthy diet, whilst high meat intake is in-line with participants' perceptions of meat being healthy and a source of protein. Therefore, participants' dietary intakes do not necessarily reflect their views on healthy eating. This may be due to inaccuracies in dietary intakes or alternatively participants' understanding of healthy eating may not influence their eating practices, with other determinants mentioned in this study overriding this. Further research is required to explore the link between participants thoughts regarding perceptions and determinants of healthy eating, and actual dietary intakes.

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Conclusion

In conclusion, high-level male adolescent rugby players living in New Zealand have a good understanding of what eating for health and performance means. Determinants of healthy eating related to both adolescent and sport related lifestyles. An emphasis on positive role-modelling and support from family, peers and the team environment may enable healthy eating practices. Further research would be useful to explore whether these determinants are associated with dietary intake, and perceptions and determinants of healthy eating in other adolescent athletes. This would strengthen the understanding of how to best support adolescent athletes develop healthy eating habits and meet their nutrition requirements for sport.

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Chapter Four: Conclusion and Recommendations

4.1. Overview and Achievement of the Aims and Objectives of the Study

This study aimed to explore the perceptions and determinants of healthy eating for high performing male adolescent rugby player living in Auckland, New Zealand. A healthy diet was perceived by high performing male adolescent rugby players living in New Zealand as a diet that includes balance and variety, portions according to energy needs and specific foods. Balanced was described in terms of carbohydrates, protein and fruits and vegetables. Specific foods mentioned that were healthy were fruit, vegetables, animal foods, dairy products, porridge, wheat biscuits, potatoes, rice, pasta and bread. These foods are typically in-line with New Zealand healthy eating recommendations, however participants did not identify wholegrain breads and cereals, low-fat dairy products and lean meats as important components of healthy eating (Ministry of Health, 2012).

There was some confusion relating to protein supplements in the diet whilst sports drinks were considered healthy if consumed for sporting needs. The overall view of supplements appeared to be that participants were too young to take them. Natural foods were thought to be better than protein supplements, however, participants mentioned protein supplements as a convenient way to achieve their protein requirements in and beneficial for gaining muscle. However, with high intakes of meat seen in this group, participants are likely to be meeting their protein requirements with food alone. It is possible that these athletes are not aware of the risks associated with excessive amounts of protein in the diet.

The adolescent male high performing rugby players recruited had determinants of healthy eating that encompassed the macro-level, physical and social environments as well as individual factors. Determinants related to general lifestyles of adolescents and/or sporting lifestyles of athletes. General determinants included peers, family and food availability, and the cost, convenience and taste of food. General and sport-specific determinants included the media, physical appearance goals, and feeling good. Sport-specific determinants included sports performance, motivation to perform, team culture, and the timing, amount and types of food on the GI tract.

Peers and family members were both enablers and barriers depending on whether they supported healthy eating or not. The cost, convenience and taste of food was a barrier due to unhealthy food perceived as being cheaper, more convenient and tasting good. The influence of media was not just through advertising, but also through social media role models, an emerging factor to consider when working with adolescent rugby players. Physical appearance goals and feeling good were both

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motivating factors for participants to eat healthy, with feeling good resonating with participants as a benefit of healthy eating. As these players had ambitions to play professionally, determinants of healthy eating were linked to sports performance, motivating them to eat healthy when playing rugby, but lacking when sports performance was no longer a factor. Team culture for these participants was associated with healthy eating, which demonstrates the influence the team has on individual players. The impact of food choices on the gastrointestinal system influenced food choices on game day, with players avoiding large amounts of food and fatty foods close to game time.

4.2 Strengths and Limitations of the Study

Participants had varied socio-demographic backgrounds and ethnicities, however, were recruited solely from the Auckland region, limiting generalisability to the wider New Zealand regions. Interviews were individual, limiting potential peer influence which may be the case with focus groups. However, individual interviews were not anonymous, potentially influencing the truth of participant answers in order to meet perceived expectations. Interview responses were analysed using investigator triangulation with three researchers exploring themes individually and then as a collective. This cross-verification process in investigator triangulation provides greater credibility to themes which arise from the analysis of results. While not a main objective of the study, dietary intake was self-reported and retrospective, therefore, actual intakes may differ compared with what was reported. Furthermore, participants' dietary intakes did not necessarily correlate to their healthy eating perceptions.

4.3 Final Recommendations and Conclusions

Perceptions of healthy eating by participants are relatively in accordance with New Zealand recommendations (Ministry of Health, 2012), except for the use of protein supplements. Male adolescent rugby players need to understand the risks of excessive protein intakes from supplements and the **protein in the food they are consuming being sufficient in meeting requirements alone**. Sports dietitians, nutritionists, coaches and sports management should be aware of this confusion and **discourage the use of protein supplements, outlining the risks involved**.

The cost, convenience, and taste of unhealthy food options compared to healthy food options was a perceived barrier to healthy eating. Therefore, when sports dietitians and nutritionists are providing

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nutrition advice, it is important that they **make sure that healthy food recommendations are inexpensive, tasty, quick and easy to prepare.**

During 'off-season' or injury, motivation to continue eating healthy is lacking as players are no longer eating for sports performance. Sports dietitians, nutritionists and coaches should work with young rugby players during these times and **keep in contact when they are not playing rugby for their continual motivation** to stay on track with healthy eating.

These young rugby players looked up to professional rugby players for inspiration and motivation in reaching their rugby aspirations. These professional rugby players were followed on social media, where they post images of what they are eating or other food-related material. This influenced participants to eat similar foods, following what their rugby idols are doing. Media was also used to gain information on healthy eating, such as by using Google search. As media was a popular source of nutrition information, **it is important that these young rugby players are aware of the pros and cons of using media for nutrition information** as many sites on the internet can be misleading.

Coaches were a trusted source of nutrition information and guidance since players had developed good rapport with them over the years. This shows rapport with young players is important if wanting to provide nutrition guidance. Also, **sports dietitians and nutritionists may find it beneficial to work alongside coaches and other sports management** to create a supportive team environment for healthy eating and make sure the advice coaches are giving is in-line with New Zealand nutrition guidelines and is safe.

The association of healthy eating with feeling good appears to resonate with young male rugby players as a benefit of healthy eating. Therefore, **feeling good should be continually addressed as a motivating factor to eat healthy in nutrition support sessions.**

In conclusion, both general and sport-specific factors were determinants of healthy eating in this population. More research is required in this field to explore the determinants of healthy eating for high performing male adolescent rugby players and other adolescent athletes in order to strengthen the understanding of what will help these young athletes develop appropriate nutrition practices early on in their life and sporting career.

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6.0 Appendices

Appendix A: Participant Information Sheet

Determinants of Healthy Eating in High Performing Adolescent Male Rugby Players

INFORMATION SHEET

We would like to invite you to take part in this study which aims to explore determinants of healthy eating in high performing adolescent male rugby players.

Please read this information sheet carefully before deciding whether or not to participate.

Researcher introduction

Emily Stokes is a student in the School of Food and Nutrition at Massey University and is conducting this research as part of her Master of Science in Nutrition and Dietetics. Dr Kathryn Beck is a New Zealand Registered Dietitian and senior lecturer in the School of Food and Nutrition at Massey University. Dave Shaw is the performance dietitian for the Auckland Blues rugby team. Professor Roger Hughes is a researcher in the School of Public Health at Massey University. Dr Helen O'Connor is a senior lecturer in sports nutrition at the University of Sydney.

Why is this research important?

Young high performing rugby players are likely to receive a variety of nutrition advice from their coaches, team mates, friends, family and the media, which may be conflicting and affect overall health and performance. Therefore, it is important to explore young rugby players' understanding of healthy eating and determinants (causes) of healthy eating. This research will explore the facilitators, barriers and understanding young Auckland rugby players have towards healthy eating as well as comparing these to what players actually eat.

This research proposes to carry out interviews with rugby players to understand their perceptions of healthy eating including facilitators and barriers to healthy eating. Players will also complete a short questionnaire about their current nutrition practices.

These findings will then be used to develop a range of recommendations for providers of nutritional advice to young rugby players such as coaches and nutritionists or dietitians in order to assist them in providing appropriate and relevant dietary advice.

Who are we looking for?

We are looking for 20 male rugby players aged 16-18 years who play rugby in their school's first fifteen rugby team. You will be given a \$30 voucher for your time.

What is going to happen?

Participation in this study involves attending one interview session with the researcher. During this interview you will be asked to sign a consent form having considered this information sheet. During this session the researcher will ask for your opinions regarding healthy eating. The interview will be audio-taped and will take approximately 1 hour. We will also ask you to complete a short online questionnaire (the Athlete Diet Index) which focuses on your overall intake of food groups and food variety, as well as questions about demographics (e.g. age, ethnicity), training information, medical conditions, special diets, supplement use, and drinking habits. This questionnaire will be completed online and takes approximately 15 minutes to complete. The interview will be held either at your school, Auckland rugby

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training grounds (Alexandra Park) or at Massey University. The time and location will be arranged to suit you and the researcher.

What will happen to the information you provide?

Your decision to take part or not take part in this study and the answers you provide will not affect selection in any future teams. All information collected during this study will be confidential and will be used only for the purposes of this project. The results will be confidential to the research team and individual results not reported back to rugby personnel. To protect your privacy your real name will not be used anywhere. Instead we will use an anonymous ID code to label any information relating to you such as the transcribed information from the audio-taped interview, or any reports or articles produced. Access to any information that links your personal details to the ID code will be stored in a locked filing cabinet at Massey University and restricted to members of the research team.

When the interviews have been completed and the tapes transcribed, the findings will be written up as part of the main researcher's Master of Science Nutrition and Dietetics thesis project. A set of recommendations based on the findings of this research will be produced that nutrition providers can use to ensure their advice is relevant and appropriate to high performing adolescent male rugby players. Results of this project may be published or presented at conferences or seminars. No individual will be able to be identified.

At the end of this study the list of participants and their study identification code will be disposed of. Any raw data on which the results of the project depend will be retained in secure storage for 10 years, after which it will be destroyed.

A summary of the project findings will be available to all study participants. All participants will be sent this information via email or a personal letter.

What are the benefits and risks of taking part in this study?

- You will receive a brief report summarising the main findings of the project via mail or email.
- You will be given a \$30 voucher for your time in taking part in this research.
- The principal benefit of taking part in this study is that you will contribute to a study and our understanding of determinants of healthy eating in high performing rugby players.
- It is not envisaged that there will be any discomforts or risks to the participants as a result of participation.
- If you have any specific requirements including cultural requirements or concerns about the project, or about being a participant, please contact a member of the research team to discuss.

Who is funding the research?

The School of Food and Nutrition, College of Health, Massey University

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question;
- withdraw from the study by 1st November 2016
- ask any questions about the study at any time during participation;
- provide information on the understanding that your name will not be used unless you give permission to the researcher;
- ask for the recorder to be turned off at any time during the interview;
- be given access to a summary of the project findings when it is concluded

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Project Contacts

If you have any further questions or concerns about the project, either now or in the future, please contact:

Researcher	Supervisor
Emily Stokes BSc, Nutrition and Dietetics student	Dr Kathryn Beck, PhD, NZRD
School of Food and Nutrition, College of Health, Massey University	School of Food and Nutrition, College of Health, Massey University
Email : E.G.Stokes@massey.ac.nz	Email: k.l.beck@massey.ac.nz
Phone: (022) 3155011	Phone: (09) 414 0800 ext 43662

Dave Shaw	Roger Hughes	Helen O'Connor
Performance dietitian for the Blues Super Rugby Team	School of Public Health, Massey University	Faculty of Health Sciences, University of Sydney
Email: nutrition@daveshaw.co.nz	Email: R.Hughes@massey.ac.nz	Email: helen.oconnor@sydney.edu.au

Committee Approval Statement

This project has been reviewed and approved by the Massey University Human Ethics Committee: Northern, Application 16/33. If you have any concerns about the conduct of this research, please contact Dr Andrew Chrystall, Chair, Massey University Human Ethics Committee: Northern, telephone 09 414 0800 x 43317, email humanethicsnorth@massey.ac.nz.

Lifeline Aotearoa is a 24/7 helpline service that helps people who are distressed or need help. Their contact is 0800 543 354.

Thank you for considering participating in this study.

Appendix B: Participant Consent Form

Determinants of Healthy Eating in High Performing Adolescent Male Rugby Players

PARTICIPANT CONSENT FORM - INDIVIDUAL

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree/do not agree to the interview being sound recorded.

I wish/do not wish to have my recordings returned to me.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature: **Date:**

Full Name - printed