

**THE RELATIONSHIP BETWEEN SPORTS NUTRITION KNOWLEDGE AND
DIETARY INTAKE PATTERNS AMONG ADULT SPORTS TRAINEES IN THE
UNITED KINGDOM**

MAI TAHER FAROUN

STUDENT ID: 2012476

MAY 2023

DECLARATION

I, Mai Faroun (Student ID: 2012476), declare that this work has been carried out by me and that this dissertation is a true record of the work undertaken.

Mai Taher Faroun

Mai

11/05/2023

Name of Student

Signature

Date:

ABBREVIATIONS

BMI: Body Mass Index

CI: Confidence Intervals

Ht: Height

IDDS: Individual Dietary Diversity Scores

IRB: Institutional Review Board

Kg: Kilogram

OR: Odds Ratio

PA: Physical activity

PE: Physical Education

SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2

SD: Standard Deviation

UK: United Kingdom

WHO: World Health Organisation

Wt: Weight

Xc: Reactance

LIST OF SYMBOLS

β : Beta

DEDICATION

In the name of Allah, most gracious and most merciful.

I dedicate this dissertation to my esteemed supervisor, Chris, who believed in me from the very beginning and provided unwavering guidance, support, and encouragement throughout this journey. I am deeply grateful for your patience and wisdom throughout the programme.

To my rock, my husband Jafar, whose love, support, and understanding have been the foundation upon which I have built this achievement. Your sacrifices and unwavering belief in me have been a constant source of strength, and I am forever indebted to you for being my partner in this journey.

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OPERATIONAL DEFINITIONS

Attitude: Relates to perceptions or feelings towards something

Exercise: A physical activity undertaken to improve health and wellbeing and results in energy utilisation within the body.

Perception: Refers to a belief or way in which the meaning of something is interpreted.

Physical activity: movement of muscles that yield in utilisation of calories or energy.

Physical education: This refers to passing on of information to another person with an aim of building their capacity, empowerment and health literacy about a certain health topic.

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ABSTRACT

Introduction: It has been commonly reported that many athletes do not consume nutritionally adequate diets. This continues to highlight the premise that nutrition knowledge does not translate into healthy dietary intake patterns. The objective of this study is to assess sports nutrition knowledge and its association with dietary intake patterns among a group of adults in the United Kingdom.

Methods: A descriptive cross-sectional design with a mixed methods approach was employed. One hundred sixty-seven participants were invited to participate in an online data collection tool. A Nutrition Knowledge Assessment questionnaire was adapted to measure the general nutrition knowledge, while dietary intake was assessed using a validated Food Frequency Questionnaire. Qualitative data was collected by use of an interview guide using an in-depth interview technique. Quantitative analyses were done in IBM Statistic SPSS version 26. For all statistical tests, a p-value of <0.05 was the cut-off for statistical evidence. Qualitative data were analysed thematically.

Results: Majority of the respondents showed a fair level of sports nutrition knowledge. 149 (89.2%) had fair knowledge, 5 (3%) had good knowledge while 13 (7.8%) had poor knowledge of sports nutrition. The mean scores among females were 17.03 (SD= 4.50) while that among males was 17.63 (SD= 5.12). An independent samples T-test for mean differences showed no evidence that males performed statically better than females ($t = -0.81$, $p = 0.419$). In terms of the diet, 101 (60.5%) had a fair quality of diet obtained from the Food Frequency Questionnaire. 22 (13.2%) had a good level of dietary diversity while 41 (24.6%) had poor level of diet quality. Calories and oily foods were largely avoided while many participants were observed to have a high protein diet. The strength of the linear relationship, as measured by the Pearson correlation coefficient showed no evidence of a positive relationship ($r = 0.122$, $p = 0.118$). Results of the adjusted linear regression between knowledge and dietary intake patterns showed no evidence for an association $\beta = 0.273$, 95% CI: -0.156- 0.701, $p = 0.210$, R Square= 0.044. Qualitatively, four themes were generated (source of information, the diet I follow, hindrances and constraints & reward system that keeps me motivated).

Conclusion: There is need to create awareness of sports nutrition among the public in the form of short courses in sports nutrition or decentralising of services to sports facilities by professional sports nutritionists. The study has under covered the unmet need for mental health and psychosocial support for athletes in order to improve adherence to healthy dietary intake patterns. Findings from this study can support the establishment of nutrition education plans for athletes. The health promotion program would tackle the sources of nutrition information, rational use of supplements, performance enhancement and management, weight management and fluid an electrolyte balance.

Key words: Adults, Sports nutrition, Nutrition Knowledge, Dietary intake patterns

CHAPTER ONE

1.1 Background

Nutrition knowledge is one of the fundamental factors when establishing a healthy eating plan for an individual. This is particularly important for sports trainees and athletes who have additional metabolic and training demands. In order to optimise performance, athletes need to have a good dietary intake that is sufficient to supply all the primary nutrients that are required for muscle growth, recovery and repair (Tam et al., 2022). Several studies have explored the relationship between sports nutrition knowledge and dietary intake among adult sports men and the results indicate a weak association (Spronk et al., 2014). Some studies have indicated that higher levels of knowledge are strongly correlated with diet quality (Alaunyte et al., 2015).

However, evidence indicates that athletes consume unhealthy diets that are unable to meet their nutrition need showing that nutrition knowledge does not translate into healthy dietary intake patterns. Heikura et al., (2017) demonstrated a mismatch between nutrition recommendations and dietary behaviours of athlete. Several factors have been advanced to offer an explanation to this relationship, and among these include lack of credible sources of nutrition information, bad attitude where one knows what to consume but does not do so or does not believe that nutrition is a critical component and key ingredient of performance.

Numerous factors, including food preferences, convenience, cost, income levels, and religion are reported to affect dietary intake. In terms of sex, females have been observed to score higher than men in terms of nutrition knowledge, and this has been witnessed to influence females' role in food choices and preparation. Higher scores of nutrition knowledge have been observed among athletes who also have a higher education or socio-economic status than those of middle age than the young or older generation. Similar associations are also witnessed for dietary intake patterns, where people with higher education and social, and economic status tend to have better nutrition knowledge and dietary intake patterns (Spronk et al., 2014).

The specific role played by nutrition knowledge in contributing to the overall diet quality is reported to be complex as the association is confounded by many sociodemographic factors such as age, sex, income levels and education. While there is a general agreement regarding the role that nutrition and dietary intake patterns play in performance management, it is surprising that relatively few studies have evaluated the level of nutrition knowledge in the

general adult population in the United Kingdom. The present study, therefore, aimed to assess the levels of sports nutrition knowledge and its association with the dietary intake patterns of adult sports trainees in the UK.

1.2 Problem Statement

There is evidence to illustrate that high nutrition knowledge has the potential to translate into better food choices especially increased water, fruit and vegetable intake (Alaunyte et al., 2015). The British Dietetic Association (BDA, 2022) and British Nutrition Foundations (British Nutrition Foundation, 2022) have published dietary recommendations for sports trainees and athletes; however, there are several factors that influence an athlete's dietary intake. Hunger, taste. Price and cultural background have been identified as key determinants of food choices and dietary intake patterns. Since athletes have a complex web of factors such as peer pressure or teammates' choices that they need to consider when making food choices, it is important for athletes to have a good level of knowledge pertaining to nutrient composition and roles of particular foods to their bodies (Smart and Bisogni, 2001). This will consequently contribute to better food choices that will translate into better performance, physique and well-being.

Previously published studies have indicated that athletes tend to consume diets that are not in line with scientifically proven dietary recommendations, and thus they are unable to meet the energy and protein demands of their metabolic needs (Heikura et al., 2017; Spronk et al., 2015). It is evident that sports trainees and athletes generally exhibit suboptimal energy intake, among other nutrient deficits like protein, minerals and water. Trakman et al., (2016) reported that athletes, overall, tend to lack nutrition knowledge in energy density of foods, identification of reliable sources of nutrition knowledge and roles of micronutrients, rationale use of supplements, dietary sources of fat, vegetarian diets, and weigh management. Despite the documented gap between nutritional recommendations for athletes and dietary intake patterns, few studies have explored this relationship to document the various predictors. Therefore, this current study assessed the levels of sports nutrition knowledge among participants and their relationship with their dietary intake patterns.

1.3 Objectives of the Study

1.3.1 General Objective

To investigate the relationship between sports nutrition knowledge and dietary intake patterns among adult sports trainees in the United Kingdom.

1.3.2 Specific Objectives

1. To assess the sports nutrition knowledge of adult sports trainees.
2. To assess the dietary intake patterns of adult sports trainees
3. To investigate the relationship between the level of nutrition knowledge and dietary patterns among adult sports trainees.
4. To explore the barriers, facilitators, and perceptions of sports trainees towards nutrition knowledge and dietary intake patterns

1.4 Study Questions

1. What is the current level of sports nutrition knowledge among sports trainees in the United Kingdom?
2. What are the current dietary intake patterns and behaviours of sports trainees?
3. How is sports nutrition knowledge associated with dietary intake patterns?
4. What are the barriers, facilitators, and perceptions of sports trainees towards nutrition knowledge and dietary intake patterns?

1.5 Hypothesis

There is no relationship between the knowledge level of sports nutrition and dietary intake patterns among adult sports trainees in the United Kingdom.

1.6 Significance/ Justification

It is well established that nutrition knowledge is very important for someone to be able to meet their dietary intake recommendations especially so, for an athlete. A healthy dietary intake pattern is key to optimizing sports performance. Compared to the non-athletic general population, active sports trainees require greater amounts of energy, fluids, carbohydrate, protein, and fat in order to meet the physiological demands of the sport, sustain training and aid quick recovery. Unless an athlete adequately meets the nutritional demands, they can easily

get in relative energy deficiency in sport (Mountjoy et al., 2018) characterised by low energy intake, poor bone mineralization and performance.

This study, therefore, explored the nutritional knowledge and dietary intake patterns and behaviours of sports trainees. The resulting findings provide evidence to support the development of future nutrition education programs, focusing on improving the sports nutrition knowledge levels of athletes in relation to their dietary intake patterns.

1.7 Study Theory

The study was hinged on the Theory of Reasoned Action (Axelson et al., 1986). The theory illustrates that an individual's action is dependent on their intention to adopt the new behaviour, which is dependent on their level of knowledge. The outcomes that an individual expects to get by adopting the action are dependent on their level of knowledge of the behaviour as shown in the conceptual framework (Figure 1).

1.8 Conceptual Framework

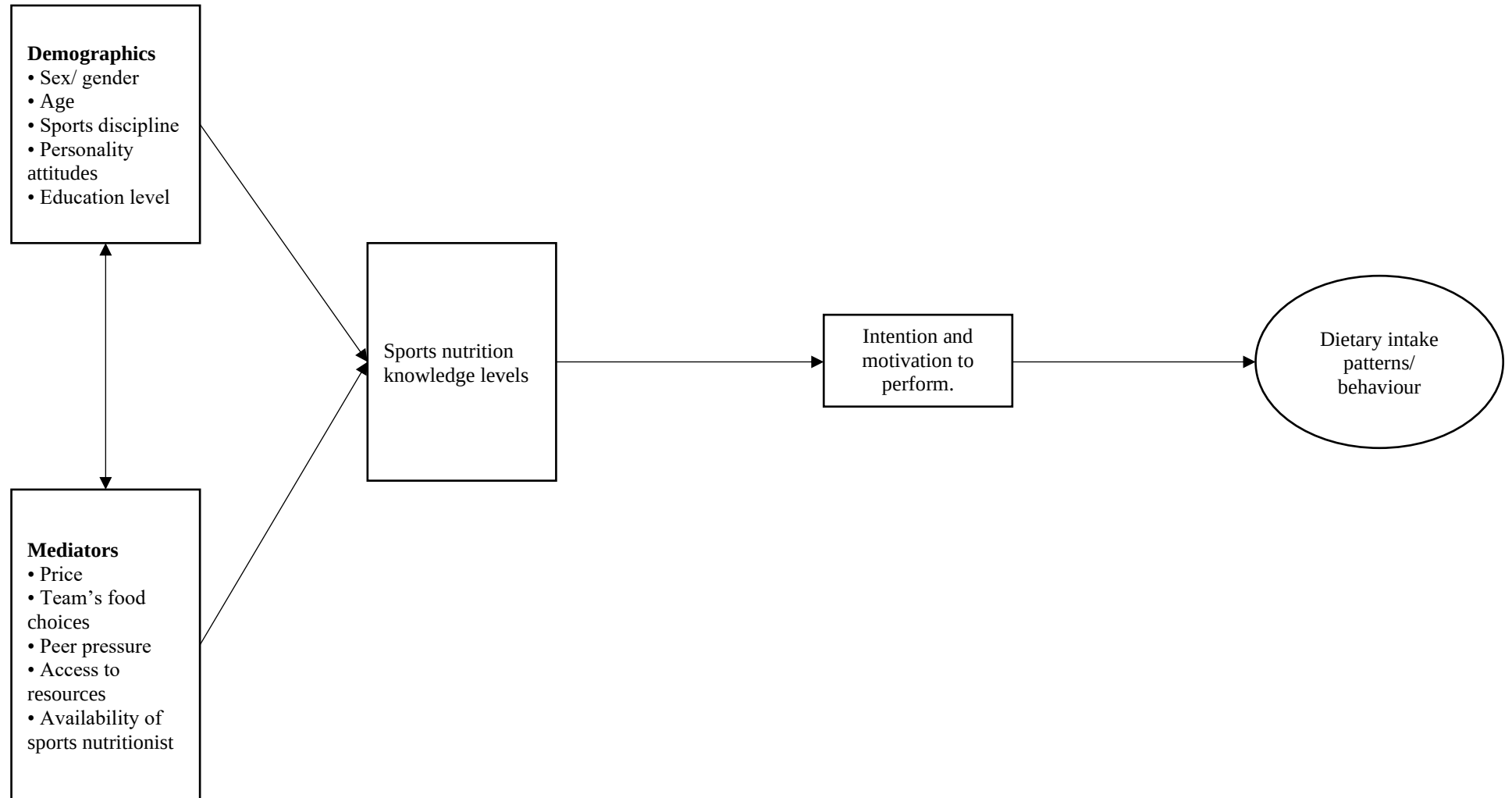


Figure 1 showing the conceptual framework.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Nutrition education programs are designed with the aim to increase the nutrition knowledge of athletes and that this knowledge will translate into improved dietary intake patterns and behaviour, which has the potential to yield better health outcomes and result in better sports performance. As reported by Sunami et al., (2016), A balanced and adequate diet is crucial for an athlete to be able to maintain an optimum physical condition and perform at their maximum ability.

There is evidence that dietary intake patterns rely strongly on nutrition knowledge, meaning that an athlete is able to translate knowledge into practice. While this is assumed, it is not usually the norm. Hunger, taste, price and cultural background have been identified as key determinants of food choice (Smart and Bisogni, 2001).

2.2 Measurement of nutrition knowledge and dietary intake patterns

Sports Nutrition Knowledge has been observed to be difficult to assess and measure since responses are dependent on a participant's level of education or their literacy levels. One's level of literacy is strongly correlated with their level of education and socioeconomic attributes. Additionally, dietary intake patterns are also difficult to objectively measure due to nutrient-to-nutrient interactions, rely heavily on participants' ability to recall past events and are very susceptible to responder biases. The Food Frequency Questionnaire is one of the most used, cost-effective and practical methods for assessing dietary intake (Spronk et al., 2014).

Among the key determinants of nutrition knowledge and practices among athletes include age, Body Mass Index, previous nutrition exposure and sex. A study in Bangladesh (Bakhtiar et al., 2021) investigated the determinants of nutrition knowledge, attitudes and practices among 260 adolescent sports trainees. The authors reported 57.69% positive practices about nutrition. Age and Body Mass Index were key predictors of sports nutrition knowledge among this sample of respondents.

2.3 Key Findings from Studies

Some studies have previously reported the nutrition knowledge of athletes being minimal. A study by Klein and colleagues assessed the sports nutrition knowledge, and dietary practices among collegiate athletes and the authors reported a low mean nutrition knowledge score of 36.9%. Among participants who had prior training in nutrition courses, they performed

significantly higher than those who had not had any college-level training. Females scored more than their male counterparts regarding questions about hydration. Most athletes reported acceptable dietary intake patterns, such as not skipping meals. The top sources of sports nutrition information for the athletes were social media, coaches, and athletic trainers (Klein et al., 2021).

Similar results were registered in Jordan. Elshahory et al., (2021) investigated the sports nutrition knowledge among coaches and athletes. This cross-sectional survey reported poor nutrition knowledge (< 50%) among 88.3% of the participants. Among the key predictors of nutrition, knowledge included Body Mass Index, education level, sport frequency and nutrition training.

In Lebanon, a similar study among professional basketball athletes and coaches was conducted among 184 players and 16 coaches. The result of the study indicated poor knowledge among both players and coaches. Among key attributed factors to poor knowledge levels include a lack of sports nutritionists, and dieticians and a lack of education campaigns (Boumosleh et al., 2021).

In Libya, Denna and colleagues investigated the nutrition knowledge of 101 professional football players, and the results indicated an alarming level of nutrition knowledge among this sample of respondents. Only 22% of the sample were aware of the foods to consume before and after exercises, while 81% of the participants could not correctly identify nutrients to be consumed during exercise (Denna et al., 2018).

A recent study explored the association between sports nutrition knowledge, nutritional intake, and risks of eating disorders amongst 36 road cyclists and results showed that sports nutrition knowledge and energy intake were insufficient and thus could not match training demands (Cook and Dobbin, 2022). Another study assessed the relationship between nutrition knowledge and dietary intake among Italian adults, and the authors reported 46% of the respondents provided correct answers in line with expert recommendations (Scalvedi et al., 2021).

On the other hand, there are several studies that have reported a good level of nutrition knowledge among sports athletes. A study investigated the nutritional knowledge and eating behaviours of professional rugby players to identify whether knowledge translated into proactive. The authors found an adequate level of nutrition knowledge (72. 82%). The study

reported a good and acceptable level of nutritional knowledge among professional rugby league players except for energy intake thresholds. Furthermore, players who scored higher on the nutritional knowledge questionnaire had a higher probability of consuming more fruits and vegetables (Alaunyte et al., 2015).

Another study that explored nutrition knowledge and dietary composition among Italian adolescent female athletes and non-athletes showed similar results. Athlete respondents demonstrated higher scores in nutrition and dietary intake patterns, and their nutritional practices were better than non-athletes. For instance, they consumed more fibre, iron, and Vitamin A. The results of this study demonstrated that athletes were relatively better than their non-athlete participants, suggesting a favourable role of sports nutrition education and knowledge on dietary practice (Cupisti et al., 2002).

A cross-sectional study among Nigerian undergraduate students explored whether nutrition knowledge and practice of athletes translated to enhanced athletic performance, and the results showed that 58.2% of the respondents had good nutrition knowledge. In comparison, 62.7% had good nutrition practices. The authors reported that having a good level of nutrition knowledge was significantly associated with good nutrition practice ($\chi^2 = 15.520$, $p=0.000$), but this was not observed with athlete's performance ($P>0.05$). The study showed that while nutrition knowledge was well translated into dietary practice, it did not affect performance (Folasire et al., 2015).

2.4 Key Gaps Identified.

Previously published studies have indicated that athletes tend to consume diets not aligned with scientifically proven dietary recommendations. It is evident that sports trainees generally exhibit suboptimal energy intake, among other nutrient deficits like protein, minerals, and water. Studies have highlighted that adult sports trainees sometimes lack nutrition knowledge, especially in nutrition areas of the energy density of foods, identification of reliable sources of nutrition knowledge and roles of micronutrients, rationale use of supplements, vegetarian diets and weight management. Despite this documented gap between nutritional recommendations for athletes and dietary intake patterns, few studies have explored this relationship to establish the various predictors in the United Kingdom.

CHAPTER THREE: METHODOLOGY

3.1 Study Design

A descriptive cross-sectional design was employed. A mixed methods approach incorporating qualitative and quantitative techniques will be utilised (Creswell and Clark, 2010).

3.2 Study Participants

Using an online sample size calculator (Raosoft, 2004), at a 5% margin of error, response distribution of 50% at 95% confidence intervals, estimated sample size = 377 participants.

ith 80% power, at the 5 % significance level, $\alpha = 0.05$). The sample size needed was 377. The study targeted to recruit 377 participants who were active sports female and male adult participants in any sport or exercise program.

Ten (10) in-depth interviews with participants were held. This, however, remained flexible until the point of saturation. As reported by Creswell (2004), the sample size for any qualitative inquiry is determined by the point of saturation (Creswell, 2004).

Simple random purposive sampling was utilised to recruit active sports participants to answer the research question. Purposive sampling ensured that only active sports participants were selected for interviews.

3.3 Data Collection

3.3.1 Quantitative

Questionnaires (sports nutrition knowledge and food frequency) were digitalised and imported into the Google forms platform. An online link was shared with participants over email or social media platforms. A validated Nutrition Knowledge Assessment questionnaire was adapted to measure the general nutrition knowledge of the participants (Parmenter and Wardle, 1999). The tool was previously used to assess athlete nutrition knowledge among adults (D'Augustine, 2018; Hendrie et al., 2008) in the UK (Raymond-Barker et al., 2007). The study employed a Food Frequency Questionnaire that has previously been used by other researchers (D'Augustine, 2018). Participants indicated (by checking a box) how often (times per day, week, or month). The FFQ has been validated and reported to be a suitable method for all people of different age groups (Burke, 2015). Critical sections of the tool included nutrient

recommendations, nutrition supplements, performance enhancement and management, weight management and fluid/ water balance. Dietary intake patterns were assessed by use of a Food Frequency Questionnaire.

3.3.2 Qualitative

The study employed qualitative approaches to explore the barriers, facilitators, and perceptions of sports trainees towards nutrition knowledge and dietary intake patterns. Ten (10) In-depth interviews were held in a convenient private location agreed upon by the study participant.

3.4 Data analysis

Results are presented as frequencies, percentages, means, and standard deviations. Pearson correlation was used to assess the linear relationship between nutrition knowledge and food-eating habits plus anthropometric indices among the participants. Dietary intake patterns were calculated as scores that were awarded in relation to frequency of intake of a particular food item. For instance, participants that consumed meat every day or during each week were not awarded a score while those that consumed meat a few times a month or not at all scored in terms of meat consumption. Total scores were tabulated by adding up scores related to each food item. Cut offs for good diet, fair diet and poor diet were tabulated as follows: <40: poor, 41- 60: Fair and ≥ 61 : Good.

Associations between nutrition knowledge and dietary intake patterns were assessed using linear regression. Body Mass Index was categorised as underweight ($\leq 18\text{kg/m}^2$), normal ($18-24.9\text{kg/m}^2$), overweight ($25- 29.9\text{kg/m}^2$) and obese ($\geq 30\text{kg/m}^2$). Knowledge scores were tabulated from the results obtained from each question. Scores were tabulated as good knowledge (≥ 25), Fair (11- 24) and poor (≤ 10 scores) All quantitative analyses were done in IBM Statistic SPSS (SPSS, Chicago, IL, USA) version 26 (International Business Machines Corporation, 2011).

Qualitative data analysis: Audio-recorded data from the in-depth interviews was transcribed for textual analysis. Field notes were also summarised to complement the transcripts. Data was analysed thematically (Braun and Clarke, 2006). Similar codes were condensed into themes, using quotations from participant' interviews.

3.5 Variables

The study's dependent variable was dietary intake patterns, while the independent variable was sports nutrition knowledge. Other variables (effect modifiers/ confounders) of interest were age, sex, education level, and access to sports nutritionists, weight, height, and Body Mass Index.

3.6 Anticipated limitations

Responses were self-reported and thus liable to social desirability biases. The study managed to recruit 44.3% of the target sample size.

3.7 Anticipated outcomes

The researcher hopes that the study findings will furnish recommendations for establishing nutrition education plans for athletes. The health promotion program would tackle the sources of nutrition information, rational use of supplements, performance enhancement and management, weight management and fluid/ water balance.

3.8 Ethical consideration

The study was approved by the ethics board of the University of Wales. Additionally, informed consent was sought and obtained from all participants. All participants had the right to withdraw at any time, and their privacy was confidentially kept. Participants were provided with feedback immediately after submission of the Google form with explanations and correct answers related to the questions. Participants were identified by study identification numbers to protect their confidentiality. All procedures conformed to the Declaration of Helsinki

3.9 Data protection policy

The study ensured that data was stored with a password protection in line with the University's data protection policy.

3.10 Gantt chart

Table 1: The Gantt Chart

Item	Oct 2022	Nov- Dec 2022	Jan- Feb 2023	Mar 2023	April 2023	May 2023
Finalising study tools						
Application for ethical approval						
Data collection						
Analysing of data and summary of study findings						
Writing up of study findings						
Working on corrections and feedback from the supervisor						
Submission of dissertation						

CHAPTER FOUR: RESULTS

4.1 Sociodemographic of the respondents

167 participants filled in the questionnaire: a deviation from the anticipated 377 participants giving a fair response rate of 44.3%. Details of the sociodemographic profiles of the study participants are summarised in Table 2.

Table 2: Sociodemographic profiles of study participants

Attribute	Frequency	Percentage (%)
Sex		
Male	76	45.5%
Female	91	54.5%
Age (years)		
18- 25	58	34.9
26- 35	40	24.1
>35	68	41
Education level		
Doctorate degree	04	2.4
Master's degree	24	14.4
Undergraduate degree	91	54.5
Diploma/ Equivalent	38	22.8
Secondary	10	06
Primary	0	0

Competed courses in human nutrition.		
Yes	20	12
No	140	84.3
Maybe	06	3.6
Affiliated to any sports club/ association.		
Yes	36	21.6
No	131	78.4

Respondents had a range of sports that they were active participants and these included football, gymnastics, handball, running, walking, biking, swimming, and badminton. Per week, respondents trained an average of 6.19 (Standard Error= 0.97). The maximum training time per week was 150 hours. In terms of how long participants had been active in a particular sports discipline, the maximum years was 30 years while the mean was 6.92 (Standard Error= 0.513).

Anthropometric indices of the respondents

Table 3 summarises the weight, height, and BMI of the respondents.

Table 3: Anthropometric Summary statistics

Statistical parameter	Weight	Height	BMI
Mean	72.93	169.51	25.4
SE of Mean	1.294	0.922	0.38
Median	70	168	24.80

Mode	60	160	22.77
Standard Deviation	16.621	11.622	4.73
Range	127	71	35.85
Minimum	45	129	17.24
Maximum	172	200	53.09

SE: Standard Error

BMI: Body Mass Index

In terms of Body Mass Index categories 81 (48.5%) were normal, 1 (0.6%) underweight, 56 (33.5%) overweight while 20 (12%) obese as shown in Figure 2.

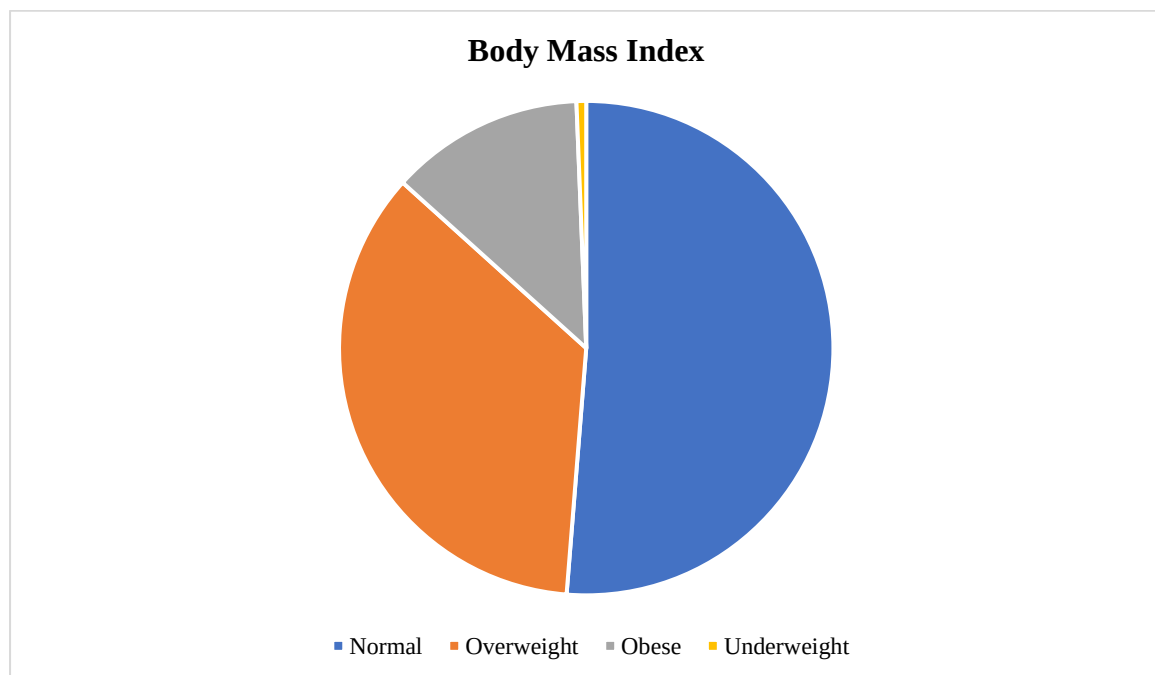


Figure 2: Distribution of BMI across the sample

In terms of sex disaggregation, there were more males that were obese while only one female participant was underweight. In terms of overweight, more males were recorded as being overweight compared to females. Results are summarised in Table 4.

Table 4: Distribution of BMI by Sex

Attribute		Frequency	Percentage (%)
Males	Normal	31	40.8
	Obese	12	15.8
	Overweight	30	39.5
	Underweight	0	0
Females	Normal	50	54.9
	Obese	08	8.8
	Overweight	26	28.6
	Underweight	01	1.1

4.2 Quantitative findings

Results regarding the sports nutrition knowledge, dietary intake patterns are presented below:

4.2.1 Sports Nutrition Knowledge

Results showed that among 167 respondents who filled out the questionnaire, the mean scores were 17.31/33 (52.46%) with the median of 18 scores. Table 1 summarises the scores per question. From the table, most respondents were able to answer the question related to weight loss, identify foods rich and low in carbohydrates while questions related to vitamins and minerals were found to be the most difficult to answer translating into the lowest scores.

Table 5: Sports Nutrition Scores

Question	Number of correct responses (Agree/ Disagree/ Not sure)
Which nutrients have the most energy per 100g	31/ 167
What athletes have to do incase they need to loose weight	80/ 167
What do you think is the best lunch option for muscle growth?	48/ 167
Do you think these foods are high or low in carbohydrates?	
Banana	65/166
Quinoa	71/164
Butter	75/166
Beans	72/163
Do you think these foods are high or low in fats?	
¼ cup mixed nuts	63/163
½ cup cottage cheese	110/166
Honey	122 (74.4)
Do you think these foods are high or low in protein?	
30g yellow cheese	63/163

½ cup cooked Quinoa	50/163
100g chicken breast	136/167
1 cup baked beans	95/164
The amount of protein in skim milk vs full cream	60/ 164
Iron is primarily used in the conversion of food into energy	64/ 164
Calcium is the largest structural component of bone	143/166
Vitamin C an antioxidant	122/164
The optimal calcium intake for athletes aged 15- 24 years is 500 mg	36/ 166
Athletes can improve performance by eating more vitamins and minerals	111/164
Vitamins provide the body with energy	91/ 166
Recommendations regarding fluid intake	69/165
Which is the recommended snack during intensity exercises?	57/166
Labels can contain false information	109/165
Alcohol contains calories and leads to weight gain	108/ 165

It is okay to have five or more drinks on a Friday or Saturday night if one does not drink across the week	124/166
Alcohol slows recovery from an injury	92/ 166
Alcohol increases nutrient urinary losses	87/ 166

Majority of the respondents showed a fair level of sports nutrition knowledge. 149 (89.2%) had fair knowledge, 5 (3%) had good knowledge while 13 (7.8%) had poor knowledge of sports nutrition. Figure 3 summarises the scores by gender. From the figure, females had more scores than their male counterparts.

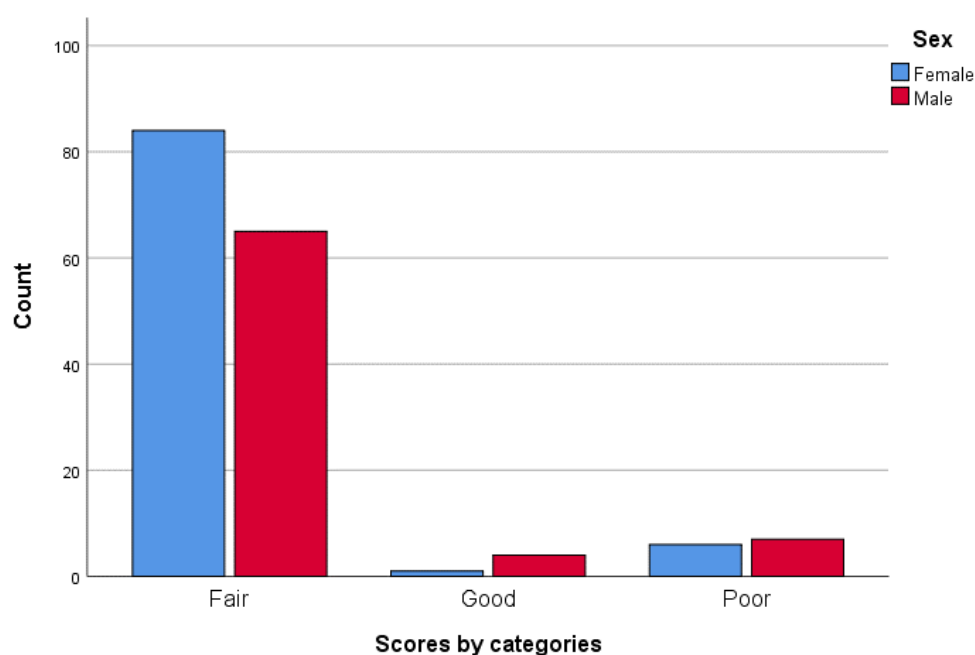


Figure 3: Sports nutrition knowledge scores by sex

The mean scores among females were 17.03 (SD= 4.50) while that among males was 17.63 (SD= 5.12). An independent samples T-test for mean differences showed no evidence that males performed statically better than females ($t = -0.81$, $p = 0.419$). In terms of Body Mass Index, total scores are summarised in Table 6.

Table 6: Knowledge scores disaggregated by BMI.

Level of Knowledge	Obesity category (BMI)	Frequency (Percentage)
Fair sports nutrition knowledge	Normal	74 (49.7)
	Obese	18 (12.1)
	Overweight	49 (32.9)
	Underweight	1 (0.7)
	Total	149 (100)
Good sports nutrition Knowledge	Normal	1 (20)
	Obese	1 (20)
	Overweight	3 (60)
	Underweight	0 (0)
	Total	5 (100)
Poor sports nutrition knowledge	Normal	6 (46.2)
	Obese	1 (7.7)
	Overweight	4 (30.8)
	Underweight	0 (0)
	Total	13 (100)

From the table, among people with good sports nutrition knowledge, the majority (4, 80%) were either overweight or obese. Among participants with poor nutrition knowledge, 5 (38.5%) were either obese or overweight.

Access to nutrition resources

In terms of access to nutrition information or sports nutritionists, respondents reported that their sports organisations or clubs do not provide for such services. 110 (67.1%) of the respondents reported no access to nutrition information, 37 (22.6%) had access while 17 (10.4%) were not sure whether they have or do not have access to nutrition resources.

In terms of previous experience of completing a formal course in human nutrition, 140 (83.8%) of respondents indicated “No” to having completed a course, 20 (12%) yes while 6 (3.6%) were not sure whether they had or had never taken a formal training course in human nutrition.

4.2.2 Dietary Intake Patterns

In terms of dietetic advice (Figure 4), most respondents 66 (40%) reported to access dietetic advice from none while the commonest source of dietetic advice is family and friends (55, 33.3%).

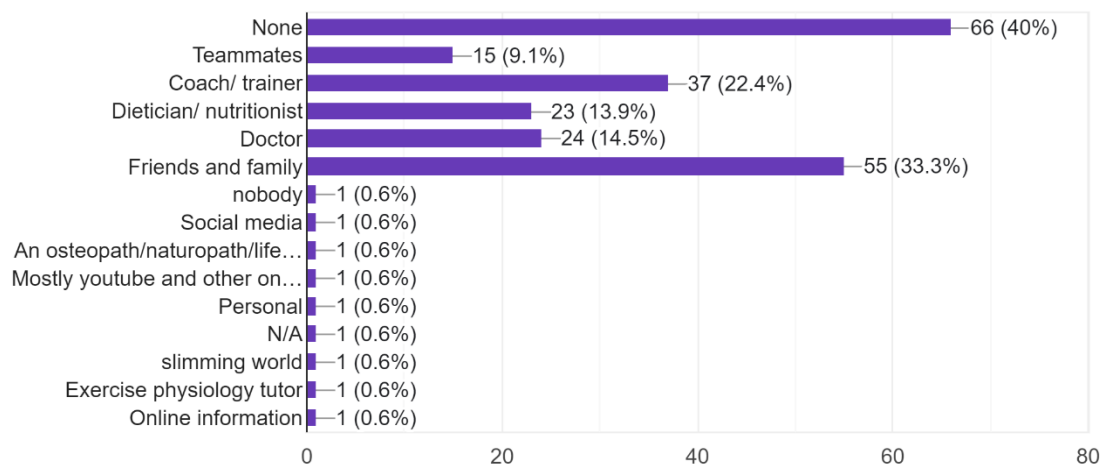


Figure 4: Common sources of nutrition information

Data from the Food Frequency Questionnaire shows a diverse intake pattern across the sample of respondents. Results were categorised into whether respondents had consumed a particular food item +4 times a day, 2-3 times a day, once per day, 2-4 times per week, once per week, 1-3 times per month or never during the month. In terms of meat consumption, results are summarised in Table 7, 8 and 9.

Table 7: Meat and meat alternatives

Frequency	Meat or Meat alternatives										
	Chicken/ Turkey	Liver/ Brain/ Kidney	Hotdogs/ Frankfurter	Bacon/ Pork	Canned meats	Rib steak	Fish	Sea food	Eggs	Vegetarian roast casserole	Mixed cheese
4+ per day	2	0	0	0	1	0	0	1	0	3	0
2-3 per day	7	1	0	0	0	1	4	2	7	8	5
1 per day	16	3	1	2	0	5	15	4	21	16	8
2-4 per week	59	9	2	22	11	37	32	18	0	37	19
1 per week	32	25	11	29	12	38	44	26	46	26	36
1-3 per month	34	31	33	32	19	43	50	44	17	29	42
Never	14	93	115	71	116	37	16	65	11	41	48
Total	167	167	167	167	167	167	167	167	167	167	167

Majority of the respondents reported to have consumed dairy products as summarised in Table 8.

Table 8: Dairy products

Frequency	Dairy Foods				
	Skimmed milk	Evaporated milk	Yoghurt	Cheese	Butter
4+ per day	1	0	0	0	0
2-3 per day	10	2	4	4	7
1 per day	28	9	19	13	15
2-4 per week	30	19	32	30	34
1 per week	21	24	40	44	39
1-3 per month	28	37	38	26	342
Never	44	70	25	45	32
Total	167	167	167	167	167

Table 9: Fruit consumption

Frequency		Fruits										
		Apple/ Pear	Orange/ Tangerine	Grape/ juice	Apricot s/ peaches (Fresh)	Prunes / Apricots (Dry)	Dates	Bananas	Strawberries (canned)	Blueberries	Melon	Avocado
4+	per day	2	2	0	1	1	1	2	1	2	2	1
2-3	per day	8	7	4	6	4	3	9	8	8	3	5
1	per day	35	27	20	19	12	17	39	17	21	13	19
2-4	per week	34	38	20	26	17	15	41	32	32	18	29
1	per week	33	38	18	21	20	22	32	31	25	32	29
1-3	per month	30	28	32	37	35	37	21	33	29	49	34
Never		20	20	65	52	71	65	20	36	42	45	43
Total		167	167	167	167	167	167	167	167	167	167	167

Scores obtained from the Food Frequency Questionnaire of the respondents are summarised in Table 10. The quality of dietary diversity was summarised into good, fair and poor.

Table 10: Dietary intake patterns of respondents

Dietary intake patterns	Frequency	Percentage (%)
Fair	101	60.5
Good	22	13.2
Poor	41	24.6
Total	167	100

Majority of the respondents 101 (60.5%) had a fair quality of diet obtained from the Food Frequency Questionnaire. 22 (13.2%) had a good level of dietary diversity while 41 (24.6%) had poor level of diet quality. A gender disaggregation shows that among females, 56 had fair diet quality, 19 good and 14 poor while among males, 45 had a fair quality of diet, 3 good and

27 poor. There was no evidence for a negative linear relationship between Body Mass Index and Dietary diversity scores (Pearson correlation coefficient $r = -0.115$, $p = 0.152$).

4.2.3 The relationship between the level of nutrition knowledge and dietary patterns

Results of the cross tabulation between sports nutrition knowledge and diet quality are summarised in Table 11.

Table 11: Sports nutrition knowledge and diet Quality

Quality of diet (dietary patterns)	Sports Nutrition Knowledge Scores			
	Fair	Good	Poor	Total
Fair	94	1	6	101
Good	20	1	1	22
Poor	34	3	4	41
Total	149	5	13	167

From Table 11, among respondents with poor sports nutrition knowledge, majority (06/ 13) had a fair quality of diet while 4/13 had poor diet with 1 respondent having a good quality of diet. Among those with a fair level of sports nutrition knowledge, 34, had a poor diet pattern, 94 with fair while 20 reported a good quality of diet. Among participants with a good level of sports nutrition knowledge, 3/5 had a poor diet while 1 had a fair and good quality of diet.

There was no linear relationship between nutrition knowledge and dietary patterns as shown in Figure 5. The strength of the linear relationship as measured by the Pearson correlation coefficient showed no evidence of a positive relationship ($r = 0.122$, $p = 0.118$).

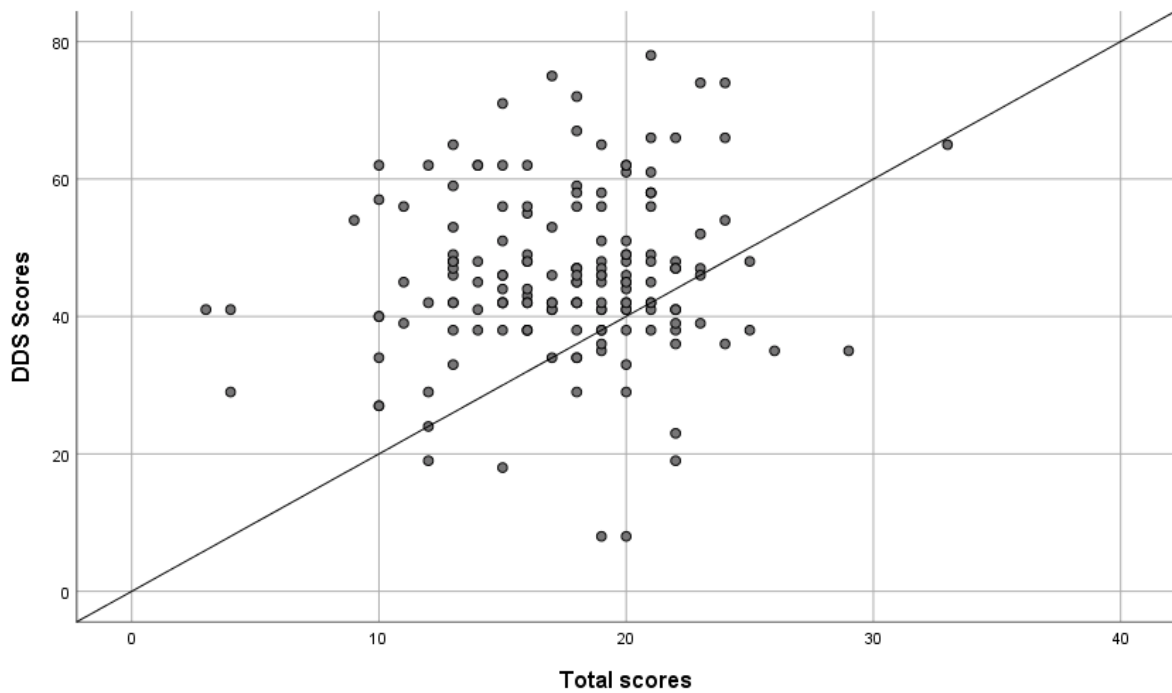


Figure 5: Scatter plot showing the linear relationship between nutrition knowledge and dietary intake patterns.

To test the null hypothesis that sports nutrition knowledge is not associated with diet patterns, Chi-square test showed evidence of an association ($\chi^2 = 19.892$, $df = 6$, $p = 0.003$). Assumptions related to regression were checked and satisfied for linearity, normal distribution, and lack of outliers. Results of unadjusted linear regression between knowledge and dietary intake patterns showed no evidence for an association $\beta = 0.122$, 95% CI: -0.086- 0.750, $p = 0.118$, $R^2 = 0.009$. To test for any negative confounding, adjustments in the model were undertaken for weight, height and BMI and results did not change. Adjusted estimates indicated $\beta = 0.273$, 95% CI: -0.156- 0.701, $p = 0.210$, $R^2 = 0.044$.

4.3 Qualitative Findings

4.3.1 Introduction

Ten (10) interviews were held with respondents who were asked to be interviewed. Details of their sociodemographic profiles are summarised in Table 12.

Table 12: Sociodemographic of qualitatively interviewed respondents

Participant ID No	Attributes
Participant 001	Adult male professional accountant and physically active in swimming
Participant 002	Adult male, physically active in the gym
Participant 003	Adult male active in weightlifting
Participant 004	Adult male, physically active in the gym and an active runner
Participant 005	Adult male, a personal trainer, and a former professional competitor
Participant 006	Adult Female of advanced age
Participant 007	Adult male, physically active in the gym and swimming
Participant 008	Adult male active in the gym and an active swimmer.
Participant 009	Adult male physically active in the gym
Participant 010	Adult male physically active in the gym

Participants indicated a good experience with participating in sports exercises. Among the commonest exercises indicated included contact sports, running, swimming, cycling and

gymnastics encompassing both cardio and resistance training. Respondent 002 said *“I used to do a lot of football although currently, I do more swimming and gymnastics”*. Respondent 007 said *“I try to stay active and have a 1.5 hour walk every day or at least five days a week”*.

In terms of frequency, many participants reported an active lifestyle with sports having several exercise regimens a week around three to five times a week. Respondent 002 said *“I go for exercises about 4- 5 times a week and I try to keep as active as possible”*. Respondent 004 said *“I run about three times a week”*. There were also participants who only had one day off in a week, taken off as a recovery day. Respondent 005 said *“I work out six days a week and only rest one day”*.

4.3.2 Theme One: Source of information

Some respondents indicated that they were not very aware of sports nutrition and mainly had limited knowledge. When asked to rate their level of knowledge, many indicated a fair level of sports nutrition knowledge. Respondent 002 said *“I am not an expert, but I can rate myself to 6/10”*. There were some respondents who were technical in nutrition. One of the respondents was a former professional gymnastic and now a personal trainer and had completed level 3 of sports and nutrition coaching. Respondent 005 said *“I have done a qualification but also I read a lot of online materials”*.

However, there was a deliberate attempt to try to access sports nutrition information from internet sources. Respondent 001 said *“Honestly, I do not know much about sports nutrition, but I have heard about carbs, protein, I really have limited knowledge”*. Some participants were able to mention of technical terms like body mass index and body fat percentages, which showed a good understanding of sports nutrition principles. Respondent 004 said *“Well I would wish to know my body fat percentage and current BMI”*. Another respondent 005 mentioned of *Vitamin D3, its sources and roles to one’s body*. Such participants with a good working level of sports nutrition knowledge can easily adopt new dietary practices that are beneficial to their health, performance and general wellbeing. For instance, respondent 007 said *“I have good knowledge as a vegan and I am aware of my vitamin B12 risk of deficiency and calcium metabolism”*.

Some respondents mentioned YouTube as their main source of sports nutrition information. Respondent 002 said *“Honestly, YouTube is my major source”*. Respondents indicated to follow particular people on YouTube who are recommended from peers and similar circles.

Respondent 003 said *“I follow heavy lifters on YouTube, and I must say all my food changes have been as a result of their recommendations”*. Online tools were the commonest sources of sports nutrition information. Phone applications were also common. Respondent 009 said *“I do not have any nutritionist, but I use applications on my phone”*.

Some participants indicated that they did not know any sports nutritionist or have never even thought of finding out about sports nutritionists but rather rely a lot on their friends and peers. Respondent 004 said *“I do not know any sports nutritionist, but I have learnt a lot from my brother who was in the military and accesses sports nutritionist”*.

4.3.3 Theme Two: Diet I follow

Majority of respondents (8/12) indicated that they do not have a particular diet that they follow while the minority (4/12) indicated that they try to follow through a healthy diet regimen. One of the respondents 001 said *“I do not follow a strict diet, but I prefer to eat in the morning, lunch and dinner with some hours in between of fast”*. Participants who had prior experience in nutrition reported having a stricter dietary regimen for instance respondent 005, a former professional competitor and currently a personal trainer, reported to follow a strict dietary intake pattern. They said, *“As a current personal trainer, I have to look good to attract as many clients as possible and thus I have to be strict with what eat and how I train”*.

There was a common response about avoiding carbs, oily foods but try to increase protein intake. Respondent 002 said *“I do not eat bread and those foods rich in carbs that will lead to increase in my weight”*. Respondents indicated a deliberate attempt to avoid carbonated drinks and alcohol. Respondent 003 said *“I have a good relationship with my stomach, and I try not to give it fizzy drinks”*.

Many respondents put in practice their sports nutrition knowledge in terms of avoiding some foods that are reported to be unhealthy. Respondent 002 said *“I try as much as I can to avoid carbs and stick to protein shakes about 70g in total”*. Many respondents mentioned to try to avoid bread at all costs due to its high carbohydrate content. Respondent 004 mentioned to avoid Coca-Cola and other fizzy drinks, they said *“Since I was born, I have not taken Coca-Cola and I do not even enjoy it”*. Some respondents follow a keto diet especially those that aim to lose -weight. Respondent 009 said *“I make sure I stay far away from carbs and only have a keto diet”*. Some respondents reported to stay away from sugar at all costs since it is one of the

major sources of calories. Respondent 010 said *“I do not take sugar anymore such that I do not get carbs”*.

Common foods that were eaten included cereals and protein dishes in the morning for breakfast. Respondent 001 said *“I eat an egg or omelette and cheese plus avocado in the morning and have a sandwich during midday”*. Water was a common starter to a day among many respondents which practice is good for rehydration after several hours of fasting during sleep. Respondent 003 said *“When I wake up, the first thing I do is drink water”*. Other participants mentioned coffee to be their favourite starter to a day. Respondent 004 said *“I usually have a coffee for breakfast”*.

During the day, participants indicated to mainly have a portion of fruits and vegetables which is commendable. There was a deliberate effort from participants to obtain at least one to two portions of fruit every day. Respondent 001 said *“I love to eat nuts and fruits and try to combine and mix it out in order to balance it”*. Another respondent 008 said *“I tend to make sure that I have a banana every day”*. Intermittent fasting was another diet plan mentioned by some respondents to have helped them with weight management, muscle building and increase in concentration. Participant 010 said *“I usually do intermittent fasting of about 20 hours a day and allow myself a window of 4 hours to eat”*.

During exercises, respondents indicated a good choice of foods that can refuel their energy stores quickly. Common choices ranged from water, protein shakes or bars. Respondent 002 said *“During exercises, I eat protein bars, banana and a few nuts sometimes”*. Many respondents reported to have a high protein diet before or after exercises. Respondent 003 said *“I have a steak or a chicken breast which sometimes I cook after gym or get it from the restaurant”*. There was a deliberate effort for participants to target high protein low carbs diet to enhance their physical performance. There was also a common practice for respondents to have pre and post recovery drinks as sources of whey protein isolates. Respondent 005 said *“During exercises, I usually have two meals; cream and rice to easily digest. During workout, I use amino acids and dextrose and after, I have a post recovery drink”*.

Among the common foods eaten across the day included fruits and vegetables, cheese, fish such as Tuna and Tilapia. Respondent 004 said *“I usually have fish across the day as my protein source”*. There was a common tendency to spoil oneself especially over the weekend. Many respondents reported “cheat days” where they eat everything and anything they feel like to feel

good about themselves. Respondent 010 said *“I try as much as possible to stay away from carbs during the week and only spoil myself over the weekend”*.

cd. Respondent 003 said *“I try to only eat a fruit or vegetable, something light before I sleep but do not eat much”*. Most of the respondents who aimed to lose weight usually reported to skip dinner. Respondent 009 said *“You know I am losing weight, so I try to not have dinner, maybe I have some fruits”*.

Many respondents reported to use supplements to enhance their diet and physical performance. Supplements included mainly nutrient based ones. Respondent 003 said *“I usually have omega 3 and 6 during the day to enhance my health”*. Whey protein was commonly used by participants as a source of highly bioavailable form of proteins. Respondent 005 said *“In the mornings of most days, I have a whey protein drink. I supplement with multi vitamins or fish oils like 3-6 capsules everyday”*.

4.3.4 Theme three: Hindrances and constraints

While participants expressed their desire to avoid carbs and fats to maintain an ideal weight, sweets, candies, and chocolates were the greatest obstacles. Some of the dietary foods that were constantly eaten by participants but indicated as barriers were sweets and candy. Respondent 001 said *“I love to eat a lot of sweets, can’t resist a sweet a day”* Respondent 002 said *“in those times I feel tired or stressed, I love to eat a chocolate to feel good”*. Respondent 004 mentioned and said, *“I usually have a portion of crisps, ice-cream, and chocolate especially during the COVID-19 times”*. Another respondent 009 said *“I love Pizza and its one of my biggest problems to avoid”*.

Depression and stress were commonly mentioned as key barriers to dietetic practice. Many participants indicated that they suffer from episodes of depression and mental breakdown arising from the daily stressors of life and during this time, there is a tendency to either make poor food choices or not go to exercise. Respondent 002 said *“Sometimes stress or when bad things happen, sometimes you wake up late and you just feel depressed or from work and during this time, you have no motivation”*.

Allergies and nutrient intolerances were mentioned by some respondents as barrier to their choice of good and recommended foods such as soy or milk. Respondent 003 said *“I do not take milk because of lactose intolerance”*.

Injuries were commonly reported by respondents to be one of the major barriers to exercise and physical activities. Many respondents had quit sports or exercises because of injuries. Respondent 004 mentioned *“I no longer go to the gym for weightlifting because I damaged my back so many years ago”*.

Food preparation and cooking were mentioned by many respondents as a common barrier to meeting dietary intake guidelines. This was attributed to fatigue and time required to prepare healthy foods especially after a workout. Respondent 005 said *“Sometimes you are too tired to prepare a healthy meal for yourself”*.

4.3.5 Theme Four: Rewards system keeps me motivated.

Some respondents expressed their plans to continuously reward their bodies with good food when they finish exercising. There was a complete avoidance of junk foods especially after an exercise regimen. Respondent 003 said *“When I finish my exercise, I try to avoid junk foods at all costs”*.

Respondents recognise the desire to keep healthy and fit and this was the commonest motivator to their dietary behaviours. The need to have a good body and shape plus the need to improve wellbeing. Respondent 001 said *“I desire to be healthy and slim, and sport is the only way to keep me in shape”* Similarly, respondent 002 said *“Exercises help you to release the bad energy from the brain and you feel better afterwards”*. Age was the other factor motivating some respondents to stick to a dietary and exercise regimen in order to avoid any pains and resulting adverse effects, Respondent 007 said *“As I grow older, I need to keep physically fit and eat well in order to avoid pains”*.

CHAPTER FIVE: DISCUSSION

5.1 Summary of main findings

1. Respondents exhibited a fair level of sports nutrition knowledge as determined by the sports nutrition knowledge scores. Most respondents were able to answer questions related to weight loss, able to identify foods rich and low in carbohydrates while questions related to vitamins and minerals were found to be the most difficult to answer.
2. Dietary data from the Food Frequency Questionnaire showed a relatively good dietary intake patterns among most of the participants. Calories and oily foods were largely avoided while many participants were observed to have a high protein diet.
3. There was no statistical evidence for an association between sports nutrition knowledge and dietary intake patterns of athletes.

5.2 Discussion

Findings showed fair level of sports nutrition knowledge at 52.46%. This showed that across the sample, there was a relatively fair level of knowledge among both males and females. As reported by Sunami et al., (2016), adequate sports nutrition knowledge is a strong predictor for athletes to make healthy food choices, maintain an optimum physical condition and perform at their maximum ability. Other studies have found similar levels of fair or poor nutrition knowledge among participants. Klein et al., (2021) reported a 36.9%, Elsahoryi et al., (2021) reported 50%, and Boumosleh et al., (2021) reported poor scores among athletes. On the other hand, Alaunyte et al., (2015) reported high scores of 72.8% among professional rugby league players. The authors further observed that players who scored higher on the nutritional knowledge questionnaire were more likely to consume more fruits and vegetables demonstrating the translation of knowledge into practice.

There was no evidence that males performed better than females ($P < 0.05$). While some other studies have indicated that female gender has been associated with better nutrition knowledge scores (Raymond-Barker et al., 2007), this was not the case in the current study. A study by Klein et al., (2021) reported female participants to perform better than their male counterparts especially in questions related to hydration. Additionally, education level was not seen to influence sports nutrition knowledge scores. Compared to other studies (Hendrie et al., 2008; Parmenter and Wardle, 1999), better-educated, middle-aged participants were observed to have higher nutrition knowledge.

Among participants with good sports nutrition knowledge, the majority were either overweight or obese while among participants with poor nutrition knowledge, about a half of them were either obese or overweight. This was illustrative of the theory of reasoned action where people are motivated to read and obtain nutrition knowledge because of an inherent reason they would wish to address and, in this case, it was weight/ obesity. For the participants with poor sports nutrition knowledge, they need to be supported and their capacity built to be able to address the risks associated with obesity or overweight.

The fair level of sports nutrition knowledge that was recorded could be explained by the fact that about 85% of the participants had not had any formal training course in human nutrition. Secondly 67.1% of the respondents reported to have no access to nutrition information from their sports organisations or clubs. As similarly reported by Elshahory et al., (2021) and Boumosleh et al., (2021), the lack of nutrition resources, sports nutritionists, and nutrition education campaigns, all contribute to low sports nutrition knowledge among athletes.

Among the major sources of sports nutrition information was online sources such as YouTube. Many participants had YouTube as their main source of information. This was similarly observed by Klein et al., (2021) who reported social media, coaches, and athletic trainers as the commonest sources of nutrition information. In this era where there is a lot of food faddism and misinformation (McBean and Speckmann, 1974) , it is important to support legitimate persons who are qualified by competent professional bodies such as the British Dietetics Associations, Institute of performance nutrition or the sport and exercise nutrition register among others. This will ensure that there is evidence-based nutrition information to the public.

In terms of diet, many participants were avoiding carbs, and oily foods but with a strong affinity for protein intake. Participants reported good dietary intake patterns involving good sources of protein, reduction of fizzy drinks and alcohol. This was to reduce calories as many of the participants were on a weight loss or weight maintenance regimen. Additionally, many participants indicated to have at least two portions of fruits and vegetables every day. Overall, participants had an acceptable pattern of diet with good food choices. Many participants also reported to be practicing intermittent fasting that has been reported to support weight management and improve performance among athletes (Mandal et al., 2022).

Among the common barriers to application of sports nutrition knowledge was peer pressure, unavailability of enough time for food preparation and the overabundance of sweet foods and

candy. Many participants indicated that they use sweet foods as coping strategies against depression and the common stressors of life. A study by Kris-Etherton et al., (2020) explored the association between nutrition and behavioural health disorders of anxiety and depression and the authors reported that there is an intrinsic relationship between stress and diet quality. Many people tend to choose sweets and candy-based foods during depression as a way to feel good about themselves.

There was a common use of nutrition supplements to enhance their diet and physical performance such as protein isolates, omega 3 and 6 fish oils, and whey protein. While these supplements are a good source of bioavailable nutrients (Taylor, 2020), there is need for professional support and guidance by a sports nutritionist. Consumers need to be guided on the best supplements for their physical and metabolic needs, manage any side effects, and monitor dosages. Results of the in-depth interviews indicated that one of the participants had not carried out a blood test to check their metabolic profiles but were continuously taking supplements without close monitoring by a professionally qualified worker (Dwyer et al., 2018).

5.3 Strengths and Limitations

Some of the key strengths of the study include a selection of diverse group of participants and the use of a mixed methods approach. The qualitative findings obtained provide a further insight into the experiences and perceptions of participants related to sports nutrition knowledge and dietary intake patterns. The use of online Google form and telephone interviews offered a safer way of data collection in line with COVID-19 prevention protocols and guidelines.

There are some limitations to this study. Participation was randomly sampled from sports and exercise locations such as gyms, and team sports grounds and thus the results might not be representative of the overall population except for the physically active people. Additionally, social desirability and responder bias may not be ruled out. Lastly the sports nutrition knowledge questionnaire and the food frequency questionnaire rely on participants' ability to correctly recall past food intake, which is subject to recall bias.

5.3 Recommendations

From the study findings, there is need to create awareness of sports nutrition among the public. This can be in form of short courses in sports nutrition or decentralising of services to sports

facilities by professional sports nutritionist. Additionally, this will make the public aware of the availability of sports nutritionists that was found to be lacking.

There is need for mental health and psychotherapy services provided in sports clubs and facilities to support clients in adopting and sticking to an agreed sports regimen and dietary intake pattern. Unless mental health is addressed, there will continue to be challenges related to adherence towards professional support and guidelines.

Since most participants indicated to obtain their sports nutrition knowledge from YouTube, there is need to support already existing channels or and create new channels run by certified sports nutritionists where there will be sound and evidence-based knowledge shared with the public.

As some of the participants found cooking time limited, consumers are encouraged to practice bulk cooking of healthy foods to save on time and to counter fatigue especially in times of post exercise recovery. Additionally, sports nutritionist can start offering cooking lessons and practical classes to consumers and the public.

5.4 Conclusion

This cross-sectional study conducted among adult athletes has investigated the relationship between sports nutrition knowledge and dietary intake patterns through a mixed methods approach. Results indicated no evidence for a relationship. However, findings related to sports nutrition levels of participants and their dietary intake habits will support the set-up of public health and sports nutrition policies and activities geared towards improvement of sports nutrition knowledge levels among the public. Findings of the study can furnish recommendations for the establishment of nutrition education plans for athletes. The program would tackle the sources of nutrition information, rational use of supplements, performance enhancement and management, weight management and fluid an electrolyte balance.

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APPENDICES

APPENDIX I: PARTICIPANT INFORMATION SHEET

Introduction:

Nutrition is vital for optimal athletic performance. This study aims to investigate the nutritional knowledge of athletes in the UK. You are invited to participate in the research entitled “the relationship between sports nutrition knowledge and dietary intake patterns among adult sports trainees in the United Kingdom” as a participant. This study is being taken as master’s dissertation research project by Mai Faroun, a student at the Department of Sports and Exercise Nutrition, University of Wales Trinity Saint David. The researcher is being supervised by Chris Cashin and Nalda Wainwright.

What do we expect from the participants?

The questionnaire needs you to recall past dietary intake patterns and questions related to sports nutrition knowledge. The questionnaire will take a maximum of 30 minutes to complete. All information is confidential, and you will not be required to identify yourself or provide personal information. All data collected will be anonymised.

Are there any possible benefits to you?

There are no direct benefits for you to participate. However, you will test your level of sports nutrition knowledge, and a sample of all correct answers to the questions will be provided at the end of the questionnaire. You can save this document for your future reference. Collectively the results will furnish new knowledge about sports nutrition knowledge and how it is associated with dietary intake patterns among adult trainees in the United Kingdom.

What will be done with the results?

Results collected will be analysed, and a report will be submitted to the department of Sports and Exercise Nutrition

Are there any possible risks, side effects, and discomfort to you?

There are no anticipated risks for participating in this study. However, participation in the study will require 30 minutes of your time.

Protecting data confidentiality

If you agree to participate in this study, your information will be kept confidential and only used for this research.

Right to refuse or withdraw

Participation in this research is entirely voluntary and you can leave at any time as you wish to.

Who do I ask/call if I have questions or a problem?

In case of any further questions, information can be obtained from the email 2012476@student.uwtsd.ac.uk

Participant's statement

The above information regarding my participation in this study is clear to me. I agree to participate in this study.

APPENDIX II: CONSENT FORM

We hereby request your participation in the study. It will only require you to complete the online questionnaire. You will not be required to put your name or any other primary identifiers on the forms.

I hereby acknowledge that I am aware of the purpose of the study, and I know I can refuse to participate in the research study at any point in time. I also know that submission of the online questionnaire will indicate your consent to participate in this study and my data being collated and analysed.

Signature..... Date.....

APPENDIX III: QUESTIONNAIRE

PART A: SPORTS NUTRITION KNOWLEDGE

What is your age bracket?

- ☐ 18- 25 years
- ☐ 26- 35 years
- ☐ >35 years

What is your gender? Male ☐ Female ☐ Prefer not to say ☐

What is the highest level of education you have obtained?

- ☐ Completed/enrolled in Primary school
- ☐ Completed/enrolled in secondary school
- ☐ Completed/ enrolled in diploma or equivalent
- ☐ Completed/enrolled in a university undergraduate degree
- ☐ Completed/enrolled in a university master's degree
- ☐ Completed/enrolled in a university Doctoral degree

Have you ever completed any formal courses in human nutrition?

Yes ☐ No ☐

What is the main sport you participate in?

Are you affiliated with any club/ association? Yes ☐ No ☐

On average, how many hours do you train per week? (Including all fitness activities at and away from your club/ association?)

How many years have you been participating in the selected sport?

Have any of these individuals given you dietetic advice concerning your diet? Tick all that apply

- ☐ Teammates
- ☐ Coach/ trainer
- ☐ Dietician/ nutritionist
- ☐ Doctor
- ☐ Friends and family
- ☐ Others

Does your sporting organisation provide you with access to nutrition information or sports nutritionists?

Yes ☐ No ☐ May be ☐

What is your weight in Kg?

What is your height in cm?

Which nutrients do you think have the most energy per 100g?

- ☐ Carbohydrates
- ☐ Proteins
- ☐ Fat
- ☐ Not sure

When weight loss is desired, generally, athletes should

- ☐ Decrease carbohydrate intake to less than 50g per day

- ☐ Decrease fat intake to less than 20g per day
- ☐ Decrease calories by decreasing carbohydrates, Fat and Protein
- ☐ Not sure

What do you think is the best option for lunch for an athlete to gain weight (muscle)? Assuming they have trained in the morning and had breakfast and a mid-morning snack.

- ☐ A mass gainer protein shake and 3-4 scrambled eggs
- ☐ Pasta with lean mincemeats and vegetable sauce plus a dessert of fruits, yoghurt and nuts
- ☐ A large piece of grilled chicken with a side salad (lettuce, cucumber and tomato)
- ☐ A large steak and fried eggs
- ☐ Not sure

How much carbohydrate do you think is recommended for an athlete taking a moderate to high-intensity endurance training program for 1-3 hours per day?

- ☐ 1-3 carbohydrates per kg body weight per day
- ☐ 5-8 carbohydrates per kg body weight per day
- ☐ 15- 25% of total daily calorie intake
- ☐ 75- 85% of total calorie intake
- ☐ Not sure

Do you think these foods are high or low in carbohydrates?

	High	Low	Not sure
1 medium banana			
½ cup cooked quinoa			
1 tablespoon butter			
1 cup baked beans			

Which of the following foods do you think contains the least carbohydrates

- ☐ 1 cup boiled rice
- ☐ 2 slices of white sandwich loaf bread
- ☐ 1 medium-boiled potato
- ☐ 1 medium ripe banana

Do you think these foods are low or high in fat

	High	Low	Not sure
½ cup of cottage cheese			
1 tablespoon polyunsaturated margarine			
¼ cup mixed nuts			
1 tablespoon honey			

Do you think these foods are high or low in protein?

	High	Low	Not sure
100g chicken breast			
30g yellow cheese			
1 cup baked beans			
½ cup cooked quinoa			

The amount of protein in skim milk compared to full cream is:

- ☐ Significantly less
- ☐ About the same
- ☐ Significantly more
- ☐ Not sure

Which of the following statements about the role of different micronutrients. Please select agree, disagree or not sure

	Agree	Disagree	Not sure
Calcium is the largest structural component of bone			
Vitamin C acts as an antioxidant in the body			
The main role of iron is the conversion of food into usable energy			

The following statements are about athletes' vitamin and mineral requirements. Please select agree, disagree or not sure.

	Agree	Disagree	Not sure
Athletes have increased magnesium needs due to losses in sweat			
Women who are menstruating have higher iron needs than men			
The optimal calcium intake for athletes aged 15 to 24 years is 500 mg.			
A physically fit person eating a nutritionally adequate diet can improve their performance by eating more vitamins and minerals			
Vitamins provide the body with energy			

Athletes should drink water during activities in order to

- ☐ Maintain plasma (blood) volume
- ☐ Prevent dry mouth
- ☐ Maintain sweat volume
- ☐ All of the above
- ☐ Not sure

Regarding fluid intake during physical activity, current recommendations encourage athletes to:

- ☐ Drink 50-100 ml every 15- 20 minutes
- ☐ Suck on ice cubes rather than drinking during practice
- ☐ Drink sports drinks e.g., Powerade, instead of water when exercising
- ☐ Drink to a plan based on body weight changes during training sessions performed in a similar climate
- ☐ Not sure

Which of the following best meets the recommendation for a snack consumed during huge-intensity exercise lasting 90 minutes?

- ☐ A protein shakes
- ☐ A ripe banana
- ☐ 2 boiled eggs
- ☐ A handful of nuts
- ☐ Not sure

Supplements labels may contain false or misleading information

- ☐ True
- ☐ False
- ☐ Not sure

When consumed as part of the diet, pure alcohol (ethanol) contains calories and, therefore, can lead to weight gain.

- ☐ Agree
☐ Disagree
☐ Not sure

The following statements are in relation to alcohol consumption. Please select agree, disagree or not sure.

	Agree	Disagree	Not sure
If someone does not drink at all during the week, it is okay for them to have five or more drinks on a Friday or Saturday night			
Drinking large amounts of alcohol can reduce recovery from injury			
Alcohol has been shown to increase urinary losses during post-exercise recovery			

PART B: FOOD FREQUENCY QUESTIONNAIRE

The following food frequency questionnaire is designed to estimate your everyday eating plan. For each food listed, check the box representing the frequency with which you ate the food item in the past 3 months. The pattern you report should reflect usual eating habits and not what you think you should eat. The boxes include monthly, weekly and daily categories:

Never or (about) less than once a month (<1/month)

1-3 (times) per month

1 per week (about once a week)

2-4 (times) per week

5-7 times a week (or about once a day)

2-3 times a day

4 + times a day

If you cannot estimate your usual intake of the food for any reason, leave the item blank.

Food Item	Average use last three months						
	Never or ≤ 1 a month	1-3 per month	1 per week	2-4 per week	1 per day	2-3 per day	4+ per day
MEATS AND OTHER ALTERNATIVES							
Chicken or turkey (serving)							
Liver, brains, kidneys, sweetbreads							
Hot dog, frankfurter							
Bacon/ pork							
Canned meats like devilled beef, hash, chili (serving)							
Beef - chuck, ribs, steak							
Fish (Tilapia, tuna, salmon etc)							
Sea foods (crustaceans)							
Eggs							
Vegetarian roasts, casseroles, etc							
Mixed cheese dishes							
DAIRY FOODS AND FATS							
Skim milk or skim buttermilk, powder skim milk (cup)							

Half and half, evaporated milk, cream, sour cream (on fruit, cereal, in coffee, etc. (oz)							
Yogurt							
Cheeses such as skim cottage, skim mozzarella, etc. (slice or oz.)							
Butter (added to food or bread: excluded use in cooking) (tsp)							
FRUITS							
Fresh apple or pear							
Orange or tangerine							
Grapefruit (½) or Grapefruit juice (small glass)							
Peaches, apricots, plums or nectarines (fresh or canned) (1 pc. or ½ cup)							
Prunes or dry apricots (½ cup)							
Dates or figs (½ cup)							
Bananas							
Strawberries- fresh, frozen or canned (½ cup)							
Blackberries, blueberries, raspberries-fresh, frozen or canned (½ cup)							
Cantaloupe or honeydew melon (small slice)							
Watermelon (1 slice)							
Pineapple- fresh or canned (½ cup)							
Cherries- fresh or canned (½ cup)							
Avocado (1/4)							
VEGETABLES							
Green or string beans or asparagus (½ cup)							
Broccoli (½ cup)							
Cabbage, coleslaw or sauerkraut (½ cup)							
Cauliflower (½ cup)							
Brussels sprouts (½ cup)							
Carrots (1 whole or ½ cup cooked)							
Corn (ear or ½ cup frozen, fresh or canned)							
Spinach- raw or cooked (½ cup)							
Green or red peppers (½ cup)							
Kale, mustard, chard, beet or other greens (½ cup)							
Iceberg or head lettuce (cup)							
Eggplant, zucchini, other summer squash (½ cup)							
Yams and sweet potatoes (½ cup)							
Tomatoes (1 or ½ cup)							
Lentils, chickpeas, kidney, pinto or other beans- plain or baked							
SWEETS AND BAKED PRODUCTS							
Pie (slice)							
Cake (slice)							
Cookies (all kinds)							
Brownies							
Sweet roll, coffee cake, pastry, home baked (serving)							
Crackers, (serving)							
BREADS, CEREALS, STARCHES							
Refined uncooked cereals like cornflakes, cheerio (½ cup)							
Refined hot cereals like cream of wheat, instant oatmeal, etc (½ cup)							
Unrefined cold cereals like all bran, Alpen, granola, shredded wheat, etc (½ cup)							
Unrefined cooked cereals like oatmeal, Ralston, cracked wheat, etc. (½ cup)							
Enriched breads like white, sourdough, French, Italian, corn or “unbleached flour” breads (slice)							

Whole grain breads like 100% whole wheat, stoneground whole wheat, sprouted wheat, 7 grain bread etc. (slice)							
Other breads- cracked, wheat, rye and other partial whole grains (slice)							
Potatoes (all kind)							
Pancakes or waffles or French toast (slice)							
Brown rice (cup)							
White rice (cup)							
Pasta (spaghetti, noodles, etc) (cup)							
BEVERAGES							
Coffee (cup)							
Tea (cup)							
Cocoa (cup)							
Decaffeinated coffee, or herbal tea (cup)							
Soft drinks							
Beer (bottle or can)							
Wine (glass)							
MISCELLANEOUS							
Peanut butter (tbsp)							
Popcorn (cup)							
Mayonnaise or creamy salad dressing including 1000 island, Russian, creamy Italian, blue cheese dressing (tbsp)							
Olive oil (tbsp)							
Seeds like sunflower seeds, etc. (oz)							
Walnuts (5)							
Other Salted nuts (oz)							
Other unsalted nuts (oz)							
Chocolate (small bar)							
Candy without chocolate (small bar)							
Jams, jellies, preserves, syrup (tbsp)							
Wheat germ (tsp)							
Brewer's Yeast (tsp)							
Bran (tsp)							
White or cream sauces (tbsp)							
Tomato sauce (tbsp)							
Gravy-made from meat (tbsp)							
Sugar or honey (tsp)							

For any other foods not indicated, please mention (indicate frequency)

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APPENDIX IV: THE INTERVIEW GUIDE

1. How would you rate your current level of sports nutrition knowledge?
 - a. What is your source of nutrition knowledge?
 - b. Do you consider it essential in helping you select the foods to eat
2. What are the current dietary intake patterns and behaviours of sports trainees?
 - a. What is your view about the best diet, especially for you, a sports-active individual?
3. What are the barriers to putting sports nutrition knowledge into practice?
4. What motivates you to practice sports nutrition knowledge, say, when determining the food to buy and eat?

APPLICATION FOR ETHICAL APPROVAL

In order for research to result in benefit and minimise risk of harm, it must be conducted ethically. A researcher may not be covered by the University's insurance if ethical approval has not been obtained prior to commencement.

The University follows the OECD Frascati manual definition of **research activity**: “creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications”. As such this covers activities undertaken by members of staff, postgraduate research students, and both taught postgraduate and undergraduate students working on dissertations/projects.

The individual undertaking the research activity is known as the “principal researcher”.

Ethical approval is not required for routine audits, performance reviews, quality assurance studies, testing within normal educational requirements, and literary or artistic criticism.

Please read the notes for guidance before completing ALL sections of the form.

This form must be completed and approved prior to undertaking any research activity. Please see Checklist for details of process for different categories of application.

SECTION A: About You (Principal Researcher)

Full Name:	Mai Taher Faroun				
Tick all boxes which apply:					
Member of staff:	☐	Student:	☒	Honorary research fellow:	☐
Faculty/School/Centre:					
Campus:					
E-mail address:					
Contact Telephone Number:					
For students:					
Student Number:		Undergraduate	☐		
Programme of Study:		Taught Postgraduate	☐		
Director of Studies/Supervisor:		Research	☐		

SECTION B: Approval for Research Activity

Has the research activity received approval in principle? (please check the Guidance Notes as to the appropriate approval process for different levels of research by different categories of individual)	YES	☐	NO	☒
				Date
If Yes, please indicate source of approval (and date where known):	Research Degrees Committee	☐		
	Faculty Research Committee	☐		

	Other (write in)	☐	
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Approval in principle **must** be obtained from the relevant source prior to seeking ethical approval.

SECTION C: External Ethical Guidance Materials

Please list the core ethical guidance documents that have been referred to during the completion of this form (including any discipline-specific codes of research ethics, and also any specific ethical guidance relating to the proposed methodology). Please tick to confirm that your research proposal adheres to these codes and guidelines.	
<i>Declaration of Helsinki</i>	☒
	☐
	☐

SECTION D: External Collaborative Research Activity

Does the research activity involve collaborators outside of the University?	YES	☐	NO	☒
If Yes, please provide the name of the external organisation and name and contact details for the main contact person:				
Institution				
Contact person name				
Contact person e-mail address				

Where research activity is carried out in collaboration with an external organisation

Does this organisation have its own ethics approval system?	YES	☐	NO	☐
If Yes, please attach a copy of any final approval (or interim approval) from the organisation				

SECTION E: Details of Research Activity

Indicative title:	The relationship between sports nutrition knowledge and dietary intake patterns among adult sports trainees in the United Kingdom		
Proposed start date:	December 2022	Proposed end date:	May 2023
Purpose of research activity (including aims and objectives) Outline the purpose, aims and objectives of the research activity, including key research questions. Show briefly how existing research has informed the proposed activity and explain what the research activity will add and how it addresses an area of importance. (Maximum 300 words)			
Problem statement: There is evidence to illustrate that high nutrition knowledge has the potential to translate into better food choices especially increased water, fruit and vegetable intake (Alaunyte et al., 2015). The British Dietetic Association (BDA, 2022) and British Nutrition Foundations (British Nutrition Foundation, 2022) have published dietary recommendations for athletes; however, an athlete's nutritional intake is influenced by many factors. Hunger, taste. Price and cultural background have been identified as key determinants of food choice. Since athletes have a complex web of factors such as peer pressure or teammates' choices that they need to consider when making food choices, it is important for athletes to have a good level of knowledge pertaining to nutrient composition, and roles of particular foods to the body (Smart & Bisogni, 2001). This will consequently contribute to better performance, physique and well-being.			

Previously published studies have indicated that athletes tend to consume diets that are not in line with scientifically proven dietary recommendations, and thus they are unable to meet the energy and protein demands for their metabolic load (Heikura et al., 2017; Spronk et al., 2015). Trakman et al., (2016) reported that athletes, on the whole, tend to lack nutrition knowledge in energy density of foods, identification of reliable sources of nutrition knowledge and roles of micronutrients, rationale use of supplements, dietary sources of fat, vegetarian diets and weight management. The proposed study will therefore assess the levels of sports nutrition knowledge among participants and their relationship with their dietary intake patterns.

Purpose: This study explores the nutritional knowledge and dietary intake patterns/ behaviours of athletes. This study will provide evidence to support the development of future nutrition education interventions. These programs will focus on improving the sports nutrition knowledge base which in turn will improve performance.

General objective

To investigate the relationship between sports nutrition knowledge and dietary intake patterns among adult athletes.

Specific Objectives

1. To assess the sports nutrition knowledge of adult athletes
2. To assess the dietary intake patterns of adult athletes
3. To investigate the relationship between the level of nutrition knowledge and dietary habits among adult athletes
4. To identify predictors of sports nutrition knowledge among adult athletes.

(this box should expand as you type)

Proposed methods

Provide a brief summary of all the methods that **may** be used in the research activity, making it clear what specific techniques may be used. If methods other than those listed in this section are deemed appropriate later, additional ethical approval for those methods will be needed. (Maximum 600 words)

Study design

A descriptive cross-sectional design will be employed.

Study participants

The study will target to recruit 377. Participants will be active sports female and male adult participants in any sport or exercise program.

Data collection

Questionnaires (nutrition knowledge and food frequency) will be digitalised and imported into Open Data Kit on Kobo Toolbox platform. An online link will be shared with participants. The study will employ and adapt an already existing valid tool by (Parmenter and Wardle, 1999) to assess the general nutrition knowledge among university athletes. Key sections of the tool will include nutrient recommendations, nutrition supplements, performance enhancement and management, weight management and fluid/ water balance. Dietary intake patterns will be assessed by use of a food frequency questionnaire.

Data analysis

Results will be presented as frequencies, percentages, means, standard deviations, tables and graphs. Pearson correlation will be used to assess the linear relationship between nutrition knowledge and food-eating habits among the participants. Differences in groups, such as age categories and sex, will be tested using an analysis of variance and an independent t-test, respectively. Associations between nutrition knowledge and dietary intake patterns will be

assessed using linear regression. All analyses will be done in IBM Statistic SPSS (SPSS, Chicago, IL, USA) version 20 for the analysis (International Business Machines Corporation, 2011).

Variables

The dependent variable of the study will be dietary intake patterns while the independent variable will be nutrition knowledge. Other variables (effect modifiers/ confounders) of interest will be age, sex, education level, and access to sports nutritionist.

Study theory

The study will be hinged on the Theory of Reasoned Action (Axelson et al., 1986). The theory shows that an individual's behaviour is dependent on their intention to adopt the new behaviour, which is dependent on their level of knowledge. The outcomes that an individual expects to get by adopting the action are dependent on their level of knowledge of the behaviour as shown in Figure 1.

Anticipated limitations

Responses will be self-reported and thus liable to social desirability biases.

Anticipated outcomes

We hope that the study findings will furnish recommendations for the establishment of nutrition education plans for athletes. The program would tackle the sources of nutrition information, rational use of supplements, performance enhancement and management, weight management and fluid balance.

Ethical consideration

The intended study will be approved by the ethics board of the University of Wales. Additionally, informed consent will be sought and obtained from all participants. All participants will have a right to withdraw at any time, and their privacy will be confidentially kept. Participants were identified by study identification numbers to protect their confidentiality. All electronic data were maintained in password protected files to be accessed by the researcher only.

(this box should expand as you type)

Location of research activity

Identify all locations where research activity will take place.

Online platform on Kobo collect. A link to the data collection tool will be shared with the potential participants

(this box should expand as you type)

Research activity outside of the UK

If research activity will take place overseas, you are responsible for ensuring that local ethical considerations are complied with and that the relevant permissions are sought. Specify any local guidelines (e.g. from local professional associations/learned societies/universities) that exist and whether these involve any ethical stipulations beyond those usual in the UK (provide details of any licenses or permissions required). Also specify whether there are any specific ethical issues raised by the local context in which the research activity is taking place, for example, particular cultural sensitivities or vulnerabilities of participants.

No research activity will take place outside the UK

(this box should expand as you type)

SECTION F: Scope of Research Activity

Will the research activity include:	YES	NO
Use of a questionnaire or similar research instrument?	☒	☐
Use of interviews?	☐	☒
Use of diaries?	☐	☒
Participant observation with their knowledge?	☐	☒
Participant observation without their knowledge?	☐	☒
Use of video or audio recording?	☐	☒
Access to personal or confidential information without the participants' specific consent?	☐	☒
Administration of any questions, test stimuli, presentation that may be experienced as physically, mentally or emotionally harmful / offensive?	☐	☒
Performance of any acts which may cause embarrassment or affect self-esteem?	☐	☒
Investigation of participants involved in illegal activities?	☐	☒
Use of procedures that involve deception?	☐	☒
Administration of any substance, agent or placebo?	☐	☒
Working with live vertebrate animals?	☐	☒
Other primary data collection methods, please explain in this box	☐	☒

If NO to every question, then the research activity is (ethically) low risk and **may** be exempt from **some** of the following sections (please refer to Guidance Notes).

If YES to any question, then no research activity should be undertaken until full ethical approval has been obtained.

SECTION G: Intended Participants

Who are the intended participants:	YES	NO
Students or staff at the University?	☐	☐
Adults (over the age of 18 and competent to give consent)?	☒	☐
Vulnerable adults?	☐	☐
Children under 18?	☐	☐
Prisoners?	☐	☐
Young offenders?	☐	☐
Those who could be considered to have a particularly dependent relationship with the investigator or a gatekeeper?	☐	☐

People engaged in illegal activities?	☐	☐
Others (please identify):	☐	☐

Participant numbers and source

Provide an estimate of the expected number of participants. How will you identify participants and how will they be recruited?

377 adult sports trainees/ athletes will be asked to participate.

The sample will be reached out using an online link that will be shared over emails, social media platforms like Facebook, Twitter and WhatsApp.

(this box should expand as you type)

Information for participants:	YES	NO	N/A
Will you describe the main research procedures to participants in advance, so that they are informed about what to expect?	☒	☐	☐
Will you tell participants that their participation is voluntary?	☒	☐	☐
Will you obtain written consent for participation?	☒	☐	☐
Will you explain to participants that refusal to participate in the research will not affect their treatment or education (if relevant)?	☒	☐	☐
If the research is observational, will you ask participants for their consent to being observed?	☐	☐	☒
Will you tell participants that they may withdraw from the research at any time and for any reason?	☒	☐	☐
With questionnaires, will you give participants the option of omitting questions they do not want to answer?	☒	☐	☐
Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	☒	☐	☐
Will you debrief participants at the end of their participation, in a way appropriate to the type of research undertaken?	☒	☐	☐
If NO to any of above questions, please give an explanation			
(this box should expand as you type)			

Information for participants:	YES	NO	N/A
Will participants be paid?	☐	☒	☐
Is specialist electrical or other equipment to be used with participants?	☐	☒	☐
Are there any financial or other interests to the investigator or University arising from this study?	☐	☒	☐
Will the research activity involve deliberately misleading participants in any way, or the partial or full concealment of the specific study aims?	☐	☒	☐
If YES to any question, please provide full details			
(this box should expand as you type)			

SECTION H: Anticipated Risks

Outline any anticipated risks that may adversely affect any of the participants, the researchers and/or the University, and the steps that will be taken to address them. If you have completed a full risk assessment (for example as required by a laboratory, or external research collaborator) you may append that to this form.			
Full risk assessment completed and appended? Yes ☐ No ☒			
Risks to participants For example: emotional distress, financial disclosure, physical harm, transfer of personal data, sensitive organisational information			
There are no anticipated risks to participants except their time that they will allocate to the study. Participants will be required to fill out an online tool that will not take more than 30 minutes of their time. (this box should expand as you type)			
If research activity may include sensitive, embarrassing or upsetting topics (e.g. sexual activity, drug use) or issues likely to disclose information requiring further action (e.g. criminal activity), give details of the procedures to deal with these issues, including any support/advice (e.g. helpline numbers) to be offered to participants. Note that where applicable, consent procedures should make it clear that if something potentially or actually illegal is discovered in the course of a project, it may need to be disclosed to the proper authorities			
None is applicable to this study (this box should expand as you type)			
Risks to investigator For example: personal safety, physical harm, emotional distress, risk of accusation of harm/impropriety, conflict of interest			
None is applicable (this box should expand as you type)			
University/institutional risks For example: adverse publicity, financial loss, data protection			
Not applicable (this box should expand as you type)			
Adverse outcomes List measures put in place to limit any adverse effects or outcomes of research activity where appropriate. Include any emergency protocols.			
No adverse outcomes are anticipated (this box should expand as you type)			

Disclosure and Barring Service			
If the research activity involves children or vulnerable adults, a Disclosure and Barring Service (DBS) certificate must be obtained before any contact with such participants.			
	YES	NO	N/A
Has a DBS certificate been obtained?	☐	☐	☒

SECTION I: Feedback, Consent and Confidentiality

Feedback What feedback will be provided to participants, how will this be done and when?	
Immediate feedback will be provided to participants through the online summary page where their marks concerning sports nutrition knowledge will be displayed to them. All summary page with all the correct answers will be available to each of the participant at the end of the questionnaire where they are able to download and save the answers for their future reference. Telephone numbers for the principal researcher and the study supervisor will be available for any questions or clarifications in case a respondent wishes to reach out. Additionally, a report and manuscript will be written and published to share the research findings with the rest of the community. (this box should expand as you type)	
Informed consent Describe the arrangements to inform potential participants, before providing consent, of what is involved in participating. Describe the arrangements for participants to provide full consent before data collection begins. If gaining consent in this way is inappropriate, explain how consent will be obtained and recorded.	
At the start of the online data collection tool, an information sheet will be displayed where all relevant information about the study will be detailed. Participants will be required to read and understand all the information provided. A consent form that will require signature and date will be displayed for participants to give their full consent to participating in the study. At the end of the questionnaire, it will be made aware to the respondents that submitting the form represents consent for the study team to use the information provided for purposes of the study. (this box should expand as you type)	
Confidentiality / Anonymity Set out how anonymity of participants and confidentiality will be ensured in any outputs. If anonymity is not being offered, explain why this is the case.	
No email addresses or names of respondents will be required on the questionnaires. The use of study ID numbers will ensure that responses stay anonymous The study questionnaire will not ask for or pick any geo-points coordinates or postcode information. (this box should expand as you type)	

SECTION J: Data Protection and Storage

In completing this section refer to the University's Research Data Management Policy and the extensive resources on the University's Research Data Management web pages (<http://uwtsd.ac.uk/library/research-data-management/>).

	YES	NO
Does the research activity involve personal data (as defined by the Data Protection Act)?	☒	☒
<i>"personal data" means data which relate to a living individual who can be identified— (a) from those data, or</i>		

(b) from those data and other information which is in the possession of, or is likely to come into the possession of, the data controller, and includes any expression of opinion about the individual and any indication of the intentions of the data controller or any other person in respect of the individual.		
If YES, provide a description of the data and explain why this data needs to be collected:		
(this box should expand as you type)		
Does it involve sensitive personal data (as defined by the Data Protection Act)? “Sensitive personal data” means personal data consisting of information as to – (a) the racial or ethnic origin of the data subject, (b) his political opinions, (c) his religious beliefs or other beliefs of a similar nature, (d) whether he is a member of a trade union (within the meaning of the Trade Union and Labour Relations (Consolidation) Act 1992), (e) his physical or mental health or condition, (f) his sexual life, (g) the commission or alleged commission by him of any offence, or (h) any proceedings for any offence committed or alleged to have been committed by him, the disposal of such proceedings or the sentence of any court in such proceedings.	☐	☒
If YES, provide a description of the data and explain why this data needs to be collected:		
(this box should expand as you type)		
Will the research activity involve storing personal data on one of the following:	YES	NO
Manual files (i.e. in paper form)?	☐	☒
University computers?	☒	☐
Private company computers?	☒	☒
Home or other personal computers?	☒	☐
Laptop computers/ CDs/ Portable disk-drives/ memory sticks?	☐	☐
“Cloud” storage or websites?	☒	☐
Other – specify:	☐	☐
For all stored data, explain the measures in place to ensure data confidentiality, including details of password protection, encryption and anonymisation:		
All data collected from Kobo toolbox will be downloaded as csv file and stored in an encrypted format. All electronic data will be maintained in password protected files to be accessed by the researcher only. (this box should expand as you type)		
Will the research activity involve any of the following activities:	YES	NO
Electronic transfer of data in any form?	☒	☐
Sharing of data with others at the University?	☐	☒
Sharing of data with other organisations?	☐	☒
Export of data outside the European Union or importing of data from outside the UK?	☐	☒

Use of personal addresses, postcodes, faxes, emails or telephone numbers?	☐	☒
Publication of data that might allow identification of individuals?	☐	☒
Use of data management system?	☐	☒
Data archiving?	☐	☒
If YES to any question, please provide full details, explaining how this will be conducted in accordance with the Data Protection Act (and/or any international equivalent):		
Electronic transfer of data will be done to store the data in the university computer. Data will be downloaded from an online data collection tool; Kobo toolbox and then stored on university computer for use. (this box should expand as you type)		

List all who will have access to the data generated by the research activity:
Principal Researcher
(this box should expand as you type)
List who will have control of, and act as custodian(s) for, data generated by the research activity:
Research supervisor
(this box should expand as you type)
Give details of data storage arrangements, including where data will be stored, how long for, and in what form. Will data be archived – if so how and if not why not.
Data will be stored on university computer for analysis and management until the report and manuscripts written and submitted. My study supervisor will have control/ custodian of the data and it will be stored for another two years in an encrypted format. Given the current guidelines for data publication, care to anonymous responses and remove any identifying information will be done before publicly sharing the data. (this box should expand as you type)

SECTION K: Declaration

The information which I have provided is correct and complete to the best of my knowledge. I have attempted to identify any risks and issues related to the research activity and acknowledge my obligations and the rights of the participants.

In submitting this application I hereby confirm that I undertake to ensure that the above named research activity will meet the University's [Research Ethics and Integrity Code of Practice](#)

Signature of applicant:

Mai Faroun

Date: 4th November
2022

For students:

Director of Studies/Supervisor:	
Signature:	
Date:	

For staff:

Head of School/Assistant Dean:	
Signature:	
Date:	

Checklist: Please complete the checklist below to ensure that you have completed the form according to the guidelines and attached any required documentation:

☒	I have read the guidance notes supplied before completing the form.
☒	I have completed ALL RELEVANT sections of the form in full.
☐	I confirm that the research activity has received approval in principle
☐	I have attached a copy of final/interim approval from external organisation (where appropriate)
☐	I have attached a full risk assessment (and have NOT completed Section H of this form) (where appropriate)
☒	I understand that it is my responsibility to ensure that the above named research activity will meet the University's Research Ethics and Integrity Code of Practice.
☒	I understand that before commencing data collection all documents aimed at respondents (including information sheets, consent forms, questionnaires, interview schedules etc.) must be confirmed by the DoS/Supervisor, module tutor or Head of School.

RESEARCH STUDENTS AND STAFF ONLY

All communications relating to this application during its processing must be in writing and emailed to pgresearch@uwtsd.ac.uk, with the title 'Ethical Approval' followed by your name. You will be informed of the outcome of your claim by email; therefore it is important that you check your University and personal email accounts regularly.

STUDENTS ON UNDERGRADUATE OR TAUGHT MASTERS PROGRAMMES should submit this form (and receive the outcome) via systems explained to you by the supervisor/module leader.

This form is available electronically from the Academic Office web pages:

<http://www.uwtsd.ac.uk/academic-office/>

Application Process

All staff research projects and all research students must submit the Ethical Approval Form to the **University Ethics Committee** via the Academic Office (pgresearch@uwtsd.ac.uk). Staff research directly in relation to personal study for taught undergraduate or Masters programmes should be submitted via the Faculty procedures explained below.

Taught masters and taught undergraduate research Ethical Approval Forms are considered **within Faculties**. Faculties will provide details of the specific processes for this. Where the Ethical issues within any single ethical application are of particular concern the Faculty will refer these to the University Ethics Committee. Any student activity that involves the collection of primary data needs to undergo Ethical approval, this includes assignment work as well as dissertations.

Notes for guidance in completion of this form

Section A: About You

Please complete all relevant sections

Section B: Approval for research activity

Research proposals must be approved in principle before applying for Ethical Approval. The proposal approval only becomes final when the ethical approval is received.

The process for proposal approval varies according to the individual and programme of study:

- Research students, by application on form PG1 to the Research Degrees Committee
- Taught students by review of research proposal within Faculties (Faculties provide specific details of these processes)
- Staff, by agreement by the Head of School/Assistant Dean

Section C: External Ethical Guidance materials

Many discipline areas are required to operate with the discipline specific codes of research ethics (for example health, psychology, education etc.), any such codes must be listed and you must tick to confirm that you have consulted with these.

Section D: External Collaborative Research Activity

Provide details of the external collaborative partners, where appropriate you might want to submit a copy of the external collaboration agreement with the Ethical Approval Form. If the partner requires the research to be subject to its own internal Ethical approval process then please provide details of that process and a copy of any final (or interim) approvals received from the organisation.

Section E: Details of Research Activity

Remember that the individuals reviewing this Ethical Approval Form may not have seen your research proposal, and also may not be experts in the specific area of your research. The information provided should therefore be jargon free and clearly stated.

Indicative Title: please use the same title as used on the research proposal.

Purpose: the Ethical approval process will want to ensure that the methods you propose are adequate and appropriate to address the research aims and objectives. Excessive additional data collection can be seen as unethical.

Proposed Methods: the Ethical approval process seeks to ensure that you understand the methods that are intended, and that the implementation of those methods will be appropriate and without unnecessary impact on respondents. Please be specific.

Location: this needs to mention geographical location and also local situation (for example, within Local Authority Offices in Cardiff, using a private room but close to other individuals). If you are collecting data within an organisational setting then you need to explain the permissions that you have obtained to do this.

Research Activity outside of the UK: please complete this section in detail, and note any guidance you have received. Also describe your own familiarity (or not) with the location that you will be utilising.

Section F: Scope of Research Activity

Please tick ALL of the research activities that might be undertaken. If any additional types of activity are intended then please add an extra box and describe these.

If you have answered no to all questions in F then sections G and J do not need to be completed. Section H should be considered, and may be completed. Signatures are still required in section K.

Section G: Intended Participants

Please tick all categories that might apply.

Numbers & Source: if you are using a series of different methods or research activities please list numbers for each stage/phase. Be clear about how you will find respondents. Will you use intermediaries, and if so how? How will you ensure compliance with your sampling strategy?

Information for participants: all participants should be appropriately informed about the research, what is expected of them and what will happen to the information that they provide. The Ethical review process does not ask to see this documentation, but requires this to be reviewed and approved by the Director of Studies in the case of research students, the supervisor/module tutor in relation to students on taught programmes and the Head of School/Assistant Dean in relation to staff research.

Section H: Anticipate Risks

All research carries some level of risk. The answers you provide to questions in this section will be reviewed to ensure that you have an appropriate understanding of the type of risks involved and how you can mitigate against these risks. If you have completed a full risk assessment, as required for example for laboratory work, field work, clinical tests, diving operations, or by a collaborative partner, you may append that to this form. In that case, please tick the box indicating this has been provided. You will not then be required to complete Section H.

Risk to participants Think very carefully about how your actions/questions/discussions might affect the people you are involving as participants. You might identify the risk as small but it would still be a risk. Many types of question have the potential to make respondents less content with their life / job; you need to recognise and try to ameliorate any such effects

If these are business owners, time with you may reduce profit.

In some locations physical risk is very real to both participants and yourself, please consider this.

Risk to you, the researcher Think about where you will meet people, if there are any dangers involved in the location. If you are meeting people as individuals think about using a public place. In general do not visit people in their own homes or remote locations. If you are talking to individuals about certain issues think about how their responses might affect you emotionally. What about the risk of collecting insufficient data?

Risk to the University When undertaking your research, you are acting as a member of the University (student or staff). Professionalism is important, so it is important to be well organised and well prepared. Punctuality, clarity etc. are all part of this. What will you do to ensure this? You must ensure you do not harm the good name of the University in any way and do nothing to undermine the reputation of the research it conducts and sponsors. Upholding high standards of conduct and integrity are vital in this regard. You must also conduct the research in such a way to minimise the potential for claims of negligence made against the University, its researchers and any collaborating individual or organisation. In this respect you should always comply with ethical, legal and professional frameworks, obligations and standards as required by statutory and regulatory authorities, as well as the university's Research Integrity and Ethics Code of Practice. Research misconduct in this respect can take many forms, including:

- fabrication: making up results or other outputs (eg, artefacts) and presenting them as if they were real
- falsification: manipulating research processes or changing or omitting data without good cause
- plagiarism: using other people's material without giving proper credit
- failure to meet ethical, legal and professional obligations: for example failure to declare competing interests; misrepresentation of involvement or authorship; misrepresentation of interests; breach of confidentiality; lack of informed consent; misuse of personal data; and abuse of research subjects or material
- improper dealing with allegations of misconduct: failing to address possible infringements such as attempts to cover up misconduct and reprisals against whistle-blowers

Adverse Outcomes. Think carefully about the possibilities, and cover here

Section I: Feedback, Consent and Confidentiality

Feedback to participants: outline your approach. Will interview transcripts be shared with respondents to check accuracy? Will summaries of questionnaire analysis be made available to respondents in some way? Will an overview report be provided? How and when?

Informed consent: Draft letter / e-mail / or heading (or footer) section of questionnaire must be approved by DoS/supervisor (if research student), supervisor/module tutor if taught student, or Head of School / Assistant Dean if a member of staff.

Confidentiality/Anonymity. Explain clearly how you will ensure confidentiality and anonymity.

Section J: Data Protection and Storage

Before completing this section it is necessary to read the University's Research Data Management information. The questions that follow are designed to ensure compliance with the Data Protection Act as well as established research protocols.

Many research activities will involve electronic transfer of data and use of data management systems in the summarisation and analysis of data. You will need to explain these in relation to compliance with the Data Protection Act.

Think carefully about who will have access to your data, this will include supervisors and examiners. Also that a thesis will be made available via the University library and the British Library system. If you are seeking an access bar for a period of time after completion then mention it here. If you will provide a copy of your findings, or intend to give a presentation, to a facilitating/ supporting/accessing organisation then explain that in this section. But also think about the general principle of data sharing, as explained in the Research Data Management information.

In terms of storage of data please ensure security, and also mitigate against loss of data.

Section K: Declaration

Ensure the appropriate countersignatures have been provided

Look carefully at the checklist and ensure that you comply with and tick all that are relevant to your research.