INVESTIGATING FACTORS THAT INFLUENCE ADOPTION OF AND ADHERENCE TO MEDITERRANEAN STYLE DIET IN HEALTHY ADULTS WHO LIVE IN ENGLAND

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By

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ABSTRACT

Aim: This project aimed to investigate the factors (barriers & facilitators) that influence adoption of and adherence to Mediterranean style diet (MedDiet) in adults aged 18 years old and above who live in England. For the purposes of the study, a Systematic Literature Review (SLR) and a pilot anonymous cross-sectional online questionnaire study have been conducted. The SLR informed the content of the questionnaire study.

Results: Of 3.971 retrieved articles, 10 studies fulfilled our inclusion criteria and were included in the SLR. Eight influencing factors were identified and categorized into themes: financial factors, cognitive factors, sociocultural factors, motivational factors, health and lifestyle factors, accessibility & availability factors, hedonic factors and demographic factors. The SLR results informed the content of the anonymous online cross-sectional questionnaire study. The questionnaire survey was launched online in April 2020 and it was disseminated through social media (Facebook, twitter and BU research blog). Potential participants were asked to complete the eligibility criteria, before getting redirected into the MEDAS (Mediterranean Diet Adherence Screener) score measurement section. Firstly, the questionnaire assessed current MEDAS score of each participant. Secondly, the factors associated with adoption of or adherence to Mediterranean style diet were scored based on a seven- point Likert scale, and finally, various participants' demographic and lifestyle characteristics were collected. The total MEDAS score was found to be below moderate level (5.8 ± 2.7). British citizens' MEDAS scores had significant positive correlations with the influence of family members and their upbringing ($r = 0.35$, $p = 0.03$) and their smoking habits ($r = 0.37$, $p = 0.02$).

Conclusions: Worldwide various factors related to adoption of and adherence to MedDiet was documented to have an impact into the consumption of the Mediterranean dietary pattern among adults outside Mediterranean regions. Our synthesis of previous findings from various studies provided insights into the factors that could influence adoption of and adherence to MedDiet in healthy adults globally. Moreover, our questionnaire study findings confirmed that two factors had statistical significant impact on Mediterranean diet adoption in our sample of British citizens. Concerning adherence related factors our results were not significant, but might show tendency and bigger study (larger sample) needed to elucidate the statistical significance of these results. If our findings are confirmed in future studies, nutrition professionals can consider the development of nutritional interventions based on MedDiet's influencing factors.

Keywords: Mediterranean diet, MedDiet, England, factors, barriers, facilitators, adults, adoption, adherence, systematic review, questionnaire

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List of Abbreviations

BCTs	Behaviour change techniques
BIOSIS	Biosciences Information Service
BMI	Body mass index
BP	Blood pressure
BU	Bournemouth University
CASP	Critical Appraisal Skills Programme
CHD	Coronary heart disease
CINAHL	Cumulative Index of Nursing and Allied Health Literature
CRD	Centre for Reviews and Dissemination
CVDs	Cardiovascular diseases
EBSCO	Elton B. Stephens Company
FAs	Fatty acids
FFQ	Food Frequency Questionnaire
GWG	Gestational weight gain
HDPs	Hypertensive disorders of pregnancy
HMIC	Health Management Information Consortium

IQR	Interquartile range
MD	Mediterranean diet
MEDAS	Mediterranean Diet Adherence Screener
MedDiet	Mediterranean diet
Medline	Medical Literature Analysis and Retrieval System Online
MRes	Master of Research
MUFAs	Monounsaturated fatty acids
NCDs	Non-communicable diseases
NDNS	National Diet and Nutrition Surveys
NHS	National Health Service
NTIS	National Technical Information Service
PREDIMED	Prevention with Mediterranean Diet
PROSPERO	International Prospective Register of Systematic Reviews
QR	Quick response
RNI	Reference Nutrient Intakes
SBP	Systolic blood pressure
SCT	Social cognitive theory

SD	Standard deviation
SES	Socio-economic status
SHeS	Scottish Health Survey
SLR	Systematic Literature Review
SOC	Stages of change
SPSS	Statistical Product and Service Solutions
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology
TTM	Transtheoretical model
UEB	Unhealthy eating behaviours
UK	United Kingdom
ZETOC	Z Electronic Table of Contents

CHAPTER I
INTRODUCTION

Consumption and adherence to a Mediterranean diet (MedDiet) has been consistently linked to propitious health outcomes, reduction of overall mortality and reduction in coronary heart disease mortality (Sofi, 2009; Jones *et al.*, 2011). Clinical trials have shown that adoption of a MedDiet can modulate CVD risk factors, and led to improvements in lipid profiles, insulin resistance, and markers of inflammation when compared to a low-fat diet (Jones *et al.*, 2011). Additionally, blood pressure (BP) is documented to be reduced by consumption of a MedDiet in elderly people (Perona *et al.*, 2004). Furthermore, it is reported a significant reduction, by 52%, in the incidence of type 2 diabetes among a population (n = 418) at high cardiovascular risk that followed MedDiet versus a low-fat diet (Salas-Salvadó *et al.,* 2018). Following a Mediterranean dietary pattern could be particularly beneficial in management of metabolic syndrome (Tortosa, 2007). An inverse association between adherence to the MedDiet and metabolic syndrome was found in both at-risk and healthy individuals (Sánchez-Sánchez *et al.*, 2020). It has been documented also, that MedDiet is able to prevent from excessive gestational weight gain (GWG) (Spadafranca *et al.,* 2017), able to lower abdominal adiposity in men and women (Romaguera *et al.*, 2009) and also adhering to MedDiet was correlated with a reduction in risk of Alzheimer's disease (Alzheimers and Dementia, 2015).

The Mediterranean diet refers to a way of eating that focuses on the traditional foods eaten in the countries that surround the Mediterranean Sea. This style of eating emphasizes plant-based foods, incorporates some animal foods—in particular, fish—and sparingly includes sweets, red meat and processed meats. The foundation of the Mediterranean diet is characterized by a nutritional model that consists mainly olive oil, fresh or dried fruit and vegetables, herbs, nuts, beans and whole grains, a moderate amount of fish, dairy, poultry, eggs and meat, and many condiments and spices.

Savanelli *et al.* (2017) reported a positive correlation between bone health status and adherence to MedDiet, suggesting that a high adherence to MedDiet promotes bone health. The observations among healthy adults (n = 418) noted that a specific dietary approach, such as MedDiet, can act as a factor for osteoporosis' prevention (Savanelli *et al.*, 2017). Moreover, the effect of MedDiet on depression has been investigated. Consumption of a Mediterranean style dietary pattern was found to have a protective influence and reduction in the odds of reporting incidences of the onset of depressive symptoms in mid-aged women aged 50-55 years (n=6060) in Australia (Rienks et al., 2013). Additionally, analysis of data from four longitudinal studies confirmed that adherence to MedDiet was inversely correlated with incident of depression (Sánchez-Sánchez *et al.*, 2020). Also, the PREDIMED study showed that a MedDiet supplemented with nuts could exert a beneficial effect on the risk of depression in patients with type 2 diabetes (Sánchez-Villegas *et al.*, 2013). Additionally, another a study revealed that greater adherence to Mediterranean diet during pregnancy may protect against excess offspring cardio-metabolic risk (Chatzi *et al.*, 2017).

A study conducted among 1566 mother-child pairs from USA and Greece, showed that greater adherence to Mediterranean diet during pregnancy may protect against excess offspring cardio-metabolic risk (Chatzi *et al.*, 2017). Adherence to the Mediterranean diet was estimated with an a priori defined score of nine foods and nutrients and also were measured anthropometric characteristics and blood levels of lipids, c-reactive protein and adipokines in mid-childhood (median 7.7 years) and in early childhood (median 4.2 years) (Chatzi *et al.*, 2017). Another study in Australia among 3582 women who were not pregnant at baseline in 2003 and reported at least one live birth between 2003 and 2012, has revealed that young women who followed a diet rich in vegetables, legumes, nuts, tofu, rice, pasta, rye bread, red wine and fish before pregnancy had a 42 per cent lower risk of developing gestational hypertension and pre-eclampsia. The results indicated a clear relationship between a Mediterranean style diet and a lower risk of hypertensive disorders of pregnancy (HDPs) (Schoenaker *et al.*, 2015). Additionally, ESTEEM study which was designed as pragmatic trial to assess

the effectiveness of dietary intervention on composite maternal and fetal outcomes in clinical practice among 1230 pregnant women, included education sessions, grocery shopping advice, cooking recipes for a healthy diet and advice for appropriate meal choices at restaurants in order to help adoption of the new dietary patterns (Al Wattar *et al.*, 2017). Finally, a prospective study among 3187 pregnant women, showed that low adherence to the Mediterranean pattern was associated with higher systolic blood pressure (SBP), but only in early and mid pregnancy (Timmermans *et al.*, 2011).

1.1 England's nutritional status

NDNS data shows that British population consumes too much saturated fat and not enough fruit, vegetables, and fibre (Public Health England, 2018). Only 31% of adults meet the 5A Day recommendation for fruit and vegetables and the percentage of adults aged 19 to 64 years meeting the 33 g/day fibre recommendation was only 9%, as the average consumption of fibre intake in adults is 19 g/day (Public Health England, 2018). Preliminary findings have shown that practical factors such as cost, time, meal preparation, convenience and also existing dietary behaviour and knowledge, could potentially be enabling or act as a barrier to adherence to a Mediterranean style diet in women of childbearing age in the United Kingdom (Kretowicz *et al.,* 2018).

In England, CVD causes one in four deaths, which equates to one death every four minutes. Falling mortality rates from heart disease were the biggest cause of increases in life expectancy between 2001 and 2016 in England. However, since 2011 the rate of increase in life expectancy has slowed for both sexes as improvements in heart disease mortality have plateaued (Public Health England, 2019). Especially, high blood pressure is the second largest known global risk factor for disease and disability, after poor diet, and it is estimated to affects more than one in four adults (Public Health England, 2019). Nearly two-thirds of adults (63%) in England were classed as being overweight (a body mass index of over 25) or obese (a BMI of over 30) in 2015 (Fuller *et al.,* 2016). The prevalence of obesity among adults increased sharply during the 1990s and early 2000s (Public Health England, 2014). The rate of increase has slowed down since 2001, although the trend is still upwards. The prevalence of obesity is similar among men and women, but men are more likely to be overweight (Fuller *et al.,* 2016). In England, the proportion who were categorized as obese increased from 13.2% of men in 1993 to 26.9% in 2015 and from 16.4% of women in 1993 to 26.8% in 2015 (Fuller *et al.,* 2016). Furthermore, results from the National Diet and Nutrition Surveys (NDNS) show that UK women of reproductive age fail to meet the Reference Nutrient Intakes (RNI) levels of various micro- and macronutrients (Al Wattar *et al.*, 2016).

1.2 Malnutrition as a causal factor of non-communicable diseases

Foods, diet, under nutrition and nutritional status, including overweight and obesity, are associated with elevated blood pressure and blood cholesterol, and resistance to the action of insulin. These conditions are risk factors for diet-related non-communicable diseases (DR-NCDs) (Hawkes *et al.*, 2020). Non-communicable diseases (NCDs), also known as chronic diseases, are responsible for about two-thirds of deaths worldwide, mostly in low- and middle-income countries (Ezzati & Riboli, 2012). NCDs tend to be of long duration, are the result of a combination of genetic, physiological, environmental and behaviours factors and there is an urgent need for policies and strategies that prevent NCDs by reducing their major risk factors (WHO, 2018).The main types of NCDs are cancers, cardiovascular diseases (CVDs), chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma) and type 2 diabetes (Ezzati & Riboli, 2012). A study in a Japanese population (n=338, mean age = 44 years old), suggested that dietary patterns, including higher intake of protein, fat, n-3 polyunsaturated fatty acids, n-6 polyunsaturated fatty acids, and vitamins, may be related to a decreased prevalence of obesity within patients with schizophrenia (Norio Sugawara *et al.*,2014).

Cardiovascular disease (CVD) is the leading cause of death worldwide, accounting for 17.9 million lives each year, 31% of all global deaths (Public Health England, 2019). People of all age groups, regions and countries are affected by NCDs. These conditions are often associated with older age groups, but evidence shows that 15 million of all deaths attributed to NCDs occur between the ages of 30 and 69 years. Children, adults and the elderly are all vulnerable to the risk factors contributing to NCDs, whether from unhealthy diets, physical inactivity, and exposure to tobacco smoke or the harmful use of alcohol (WHO, 2018). It is estimated that obesity is responsible for more than 30,000 deaths each year. On average, obesity deprives an individual of an extra 9 years of life, preventing many individuals from reaching retirement age. In the future, obesity could overtake tobacco smoking as the biggest cause of preventable death (Fuller *et al.,* 2016).

Obesity increases the risk of developing a whole host of diseases (Fuller *et al.,* 2016). Overweight and obesity, together with physical inactivity, are estimated to cause a large proportion of the global diabetes burden (WHO, 2016). Unhealthy diets and a lack of physical activity may show up in people as raised blood pressure, elevated blood lipids and obesity (WHO, 2018). Several dietary practices are linked to unhealthy body weight and/or type 2 diabetes risks, including high intake of saturated fatty acids, high total fat intake and inadequate consumption of dietary fibre (WHO, 2016). In 2014, 422 million people in the world had diabetes – a prevalence of 8.5% among the adult population. The prevalence of diabetes has been steadily increasing for the past 3 decades and is growing most rapidly in low- and middle-income countries. Associated risk factors such as being overweight or obese are increasing. Diabetes is an important cause of blindness, kidney failure, lower limb amputation and other long-term consequences that impact significantly on quality of life (WHO, 2016).

1.3 Eating behaviour change in order to combat the NCD's

Providing information on the benefits of healthy eating could be helpful for the promotion of Mediterranean diet, but evidence suggests that combined use of behaviour change theory or Behaviour Change Techniques (BCTs) and dietary approaches can be associated with greater effectiveness and eventually help individuals to make sustained changes to their dietary behaviours (Michie *et al.*, 2009; Browne *et al.*, 2019). The most common theories in use in nutrition interventions are the transtheoretical model/stages of change (TTM/SOC) and social cognitive theory (SCT) (Tina *et al.*, 2006), and common BCTs include motivational interviewing, goal setting, self-monitoring, social support and relapse prevention among others (Tina *et al.*, 2006; Michie *et al.*, 2009). Additionally, several unhealthy eating behaviours (UEB) were associated with weight gain in a prospective cohort study among adults (n=1638, 18-60 yrs). The three UEB with the strongest associations with weight gain were: (1) not planning the amount of food to eat (2) eating at fast-food restaurants, and (3) eating while watching TV (León *et al.,* 2016).

It is reported that the eating behaviours of individuals are important factors in the patterns of risk factors for NCDs (Ezzati & Riboli, 2013). As dietary patterns are shaped by cultural, environmental, technological, and economic factors (Ezzati & Riboli, 2013), the dietary behaviour represents a modifiable but complex lifestyle behaviour to change for the prevention and management of chronic NCDs (Browne *et al.*, 2019) Effective approaches for large-scale NCD prevention include mechanisms aiming to: (1) reduce consumption of specific harmful dietary components (Ezzati & Riboli, 2013) like dietary salt, unhealthy fats, and sugars through regulation and well-designed public education; (2) increase the consumption of fresh fruits and vegetables, healthy fats, and whole grains by lowering prices and improving range of foods in shops; (3) promote patient-centred models of care (Barry & Edgman-Levitan, 2012), and (4) enhance the use of e-Health technologies (Muller et al., 2018). Additionally, males were documented to be less likely to understand the health implications of adhering to a MedDiet (Hardin-Fanning *et al.*, 2013) and they were not so amendable to making dietary changes as females (Moore *et al.*, 2018; Wardle *et al.*, 2004). Michie *et al.* (2016) found that interventions combining self-monitoring with other BCTs derived from self-regulation theories, such as goal setting, provision of feedback, planning and goal revisiting, were more effective in promoting changes in healthy eating in the general population than other interventions not using these techniques.

1.4 Unhealthy diet patterns are linked with high obesity

Obese people are at increased risk of certain cancers, including being 3 times more likely to develop colon cancer, more than 2.5 times more likely to develop high blood pressure - a risk factor for heart disease and five times more likely to develop type 2 diabetes (Fuller *et al.,* 2016). According to various studies related to dietary patterns and obesity there is positive association between a western/unhealthy dietary pattern and overweight/obesity risk (Mu *et al.*, 2017). Bouchard-Mercier *et al. (2010)* conducted a cross-sectional study in Canada among 635 participants aged between 18 and 55 years, and reported that a diet rich in fruits and vegetables

was inversely associated with BMI and a diet rich in meat and fat was positively associated with BMI.

Furthermore, the Pound of Prevention study (n=891 women, 20-45 yrs) reported that eating fast food is linked to weight gain, and the frequency of fast food restaurant use was associated with higher energy and fat intake and greater body weight, and could be an important risk factor for excess weight gain in the population (Sherwood *et al.*, 2000). In the pre-conception period, unhealthy dietary patterns were associated with increased risk for preterm birth or gestational diabetes, in contrast with the Mediterranean style diet, which could be beneficial in pregnancy and preconception years (Hanson *et al.*, 2017). On the other hand, findings from the EPIC-PANACEA (European Prospective Investigation into Cancer and Nutrition-Physical Activity, Nutrition, Alcohol Consumption, Cessation of Smoking, Eating Out of Home, and Obesity) study which included 373,803 men and women, revealed that individuals with high MedDiet adherence lost 0.16 kg (95 % CI: −0.24, −0.07 kg) during a five year period and were 10% less likely to become overweight or obese than the low adherent participants (Romaguera *et al.*, 2010).

1.5 Mediterranean Diet food components & their pathophysiological impact

The Mediterranean Diet, known primarily as a food model, enhances the quality and safety of foods and their link to the land of origin (Vernaglione, 2009). Since the first studies in 1970s (Seven Countries Studies), the MedDiet has been recognized as a dietary pattern associated with decreased all-cause mortality and reduction in the cardiovascular risk factors level (Vitiello *et al.,* 2016). From the 1960s to the early 21th century adherence to the MedDiet declined around the world due to the westernization of eating habits. Although during the last decade there was a stabilization of Mediterranean diet adherence and even an increase (Vilarnau *et al.,* 2019). The populations that had adopted a diet based on the Mediterranean diet presented a very low rate of cholesterol in the blood and, consequently, a minimum percentage of coronary heart disease. This was mainly due to the plentiful use of olive oil, bread, pasta, vegetables, herbs, garlic, red onions,

and other foods of vegetable origin compared to a rather moderate use of meat (Vernaglione, 2009).

Recent literature confirms that the average Mediterranean Diet consumption rate contains three to nine serves of vegetables, half to two serves of fruit, 37% as total fat and 33 g/day of fibre (Davis *et al.*, 2015). The MedDiet is high in monounsaturated fat, principally olive oil, low in saturated fat, high in complex carbohydrates from legumes, high intake of cereals and whole grain breads and high fibre intake, mostly from vegetables and fruits (Vitiello *et al.,* 2016). Also includes the following dietary factors: a moderate amounts of poultry; low quantities of red meat and a moderate quantities of fish; a moderate amount of red wine. MedDiet is characterized by a high intake b-carotene, group B, C and E vitamins, folic acid, polyphenols and other phytochemicals (Kavouras *et al.,* 2010). The protective dietary effects of the MedDiet against risk for disease development are attributed to the fact that it is a well-balanced diet, characterized by a number of antioxidant, anti-inflammatory and anti- carcinogenic nutrients contained in the core food groups (fish and plant foods: vegetables, fruits, legumes, nuts and olive oil). This dietary pattern provides several phytochemicals, high levels of fibre and oleic acid, many vitamins (B2, B6, C and E), adequate folate, carotenoids, flavonoids and polyphenols, as well as a low glycemic load and a balanced ratio of n-6 essential fatty acids (FAs) (Walton, 2017). Total fat may be high (approximately 40% of total energy intake), and the monounsaturated-to-saturated fat ratio should be around two. The high content of vegetables, fresh fruits, cereals, and olive oil guarantees a high intake of beta-carotene, vitamins C and E, polyphenols, and various important minerals. These key elements have been suggested to be responsible for the beneficial effect of the diet on human health and especially on CVDs (Dontas *et al.*, 2007).

1.6 Project's aim

Before implementing a healthier diet pattern (e.g. MedDiet) it is important to understand people's views about the difficulties in relation to eating behaviour change. Therefore, by understanding their views it would be easier to support all men and women who are willing to improve their dietary patterns, their general health and prevent themselves from obesity. Investigating, identifying and analyzing barriers and facilitators to adoption of and adherence to MedDiet in adults aged 18 years old and over who live outside Mediterranean regions could be helpful in future development of nutrition interventions to promote adoption and adherence of a Mediterranean style diet in England. The current project firstly aims to (1) report results of a systematic literature review (SLR), which will be conducted in healthy adults aged over 18 years old to discover, investigate and list the factors that influence adoption of and adherence to Mediterranean diet (MedDiet) outside Mediterranean regions and (2) develop an online questionnaire survey, from SLR's findings, which will investigate the influential power of factors that tend to be barriers or facilitators to adopting or adhering to a Mediterranean style diet amongst adults who live in England.

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CHAPTER II
SYSTEMATIC LITERATURE REVIEW

Barriers and facilitators to adoption of and adherence to a Mediterranean style diet in adults: a systematic review of observational and qualitative studies

Abstract

Background: The Mediterranean diet (MedDiet) has been linked with good health. Previous research has shown that adherence to a Mediterranean style diet might be difficult for people who live outside Mediterranean regions.

Objective: The aim of this systematic review was to investigate the factors that influence adoption and adherence to a Mediterranean style diet in adults aged 18 years old and over who live inside and outside Mediterranean regions.

Design: A systematic literature review was conducted and synthesis of previous observational and qualitative studies of adults' perceptions and experiences relevant to following a Mediterranean style diet. The following electronic databases were searched in order to retrieve relevant studies: Medline, CINAHL & EBSCO.

Results: Of 3,971 retrieved articles, 10 studies fulfilled our inclusion criteria and were included in the review. Eight influencing factors were identified and categorized into themes: financial factors, cognitive factors, sociocultural factors, motivational factors, health and lifestyle factors, accessibility & availability factors, hedonic factors and demographic factors.

Conclusion: The present study through the synthesis of people's perceptions highlighted the difficulty they have to adapt to Mediterranean diet, as it was documented that they resisted changing their normal routine eating habits and food traditions.

Keywords: Mediterranean diet, MedDiet, barriers, facilitators, adults, adherence, systematic review

2.1 Aim of study

The aim of this systematic review was to investigate the factors that influence adoption and adherence to a Mediterranean style diet in adults aged 18 years old and over who live inside and outside Mediterranean regions. There is a need to critically evaluate and synthesize studies investigating all factors that influence adoption and adherence to a Mediterranean style diet, in order to comprehend why people, struggle to adopt and adhere to a Mediterranean style diet. To the best of our knowledge, no systematic review has sought to understand the factors that influence adoption and adherence to a Mediterranean style diet.

2.2   Methods

This systematic literature review was conducted following CRD's guidance for undertaking reviews in health care (Systematic reviews, 2009). Data on the barriers and facilitators to following a MedDiet were compiled according to defined outcome categories. Methods and inclusion/exclusion criteria were determined in advance and a protocol for the review was developed and sent to an advisory group of the International Prospective Register of Systematic Reviews (PROSPERO). The protocol was accepted from PROSPERO and was published online on November, 2018 (registration no. CRD42018116515).

2.2.1 Definitions

Search terms were generated by team discussion and a review of the literature. After considering the alternative spellings and closely related words terms were combined using logical ANDs and ORs to create one search string to include terms related to: "Mediterranean diet", "barriers", "enablers" and "adults". The following search string was used:
(Mediterranean diet* OR med-diet OR MD OR Mediterranean style diet* OR Mediterranean-style diet*) AND (Barrier* OR obstacle* OR difficult*) AND (enabler* OR facilitator* OR factor* OR reason* OR determinant* OR motivator* OR characteristic*) AND (adult* OR mature* OR elder* OR aged).

2.2.2 Systematic search strategy

Electronic databases: MEDLINE, EBSCO and CINAHL (Cumulative Index to Nursing and Allied Health Literature) were explored from inception by searching in "title", "abstract" and "keywords" fields until March 22, 2019. Searches were not limited by study design, but they were limited by language of publication (only English articles were included). Citation tracking and reference lists of all retrieved articles were reviewed by hand for eligible articles. Studies identified from contacting experts in the field through e-mails (directly contact via e-mail). Specialized websites were scanned using the same initial search string, in order to identify relevant grey literature, such as conference abstracts (search was conducted in ZETOC and BIOSIS Previews bibliographic databases), or unpublished papers [search was conducted using the NTIS (National Technical Information Service) and the HMIC (Health Management Information Consortium) databases]. Search results were exported to EndNote, duplicates were deleted and the remainder imported to Covidence (www.covidence.org), a web-based software product to assist the screening and organization of systematic reviews (Kellermeyer *et al.,* 2018). All studies were initially independently screened on titles and abstracts against the eligibility criteria by two researchers (DV & FT) with no conflicts. Full texts for all potentially eligible papers were obtained. Thirty-one (n=31) studies were double screened on full text by one reviewer (DV) to ensure consistency, and revisions were made to definitions and criteria accordingly.

2.2.3 Inclusion and Exclusion Criteria

Study inclusion and exclusion criteria are summarised in Table 1. Observational studies and qualitative studies were included if they reported on factors that influence adoption or adherence of a Mediterranean style diet in adults 18 years and older or dietary interventions that include food patterns similar to MedDiet. Papers must be published in English and peer reviewed full conference/journal papers to be included.

Studies were excluded if they focused on children or if they included only single components of MedDiet (where we considered "fruit and vegetables" as a single component). The inclusion and exclusion criteria were applied and piloted by all three researchers (DV, KA & FT). Then, the

assessment was performed for the full list of the identified studies. Disagreements were resolved between the two researchers (DV & FT) or by consultation with the third author (KA).

Table 1

Inclusion criteria	Exclusion criteria
(1) The studies must report factors that influence adoption or adherence to a MedDiet on healthy adults.	(1) Studies focusing on diets other than MedDiet such as vegetarian diet or Paleo diet etc.
(2) The type of studies must be either observational or qualitative.	(2) Papers that focusing only on single components of the Mediterranean style diet (fruits & vegetables were considered as one).
(3) The papers must be peer reviewed or a journal written in English language only.	(3) Written not in English language.

2.2.4 Data extraction and quality assessment

One researcher (DV) extracted data using the Covidence tool with a structured data extraction sheet including descriptive characteristics, such as, study authors, country of origin, participants' demographics, sample size, data collection method and outcomes. One other researcher (FT) independently checked the data extraction forms for accuracy and completeness and uncertainties were resolved by discussion.

The included studies were assessed for risk of bias. Observational studies were evaluated using the STROBE Statement for Observational Studies in Nutritional Epidemiology (Hörnell *et al.,* 2017) and qualitative studies were evaluated using the Critical Appraisal Skills Programme (CASP) tool (*Critical Appraisal Skills Programme, 2018)*. Two authors (DV and FT) independently evaluated the included studies for risk of bias using the criteria of the previously mentioned checklists for observational and qualitative studies and any discrepancies were resolved by discussion.

2.3 Results

The systematic literature research resulted in the identification and retrieve of 3971 citations, of which 84 were screened on full text. In total, 10 studies were included in the systematic review. The detailed study selection process is shown in Figure 1.

2.3.1 Characteristics of Included Studies

The characteristics of the included studies and ratings of risk of bias are shown in Table 2. Of the ten included studies, four were observational studies (Dijkstra *et al.,* 2015; Hardin-Fanning *et al.,* 2013; Papadaki, *et al.,* 2015; Tong *et al.,* 2018) and six (6) were qualitative studies (Kretowicz *et al.,* 2018; Moore *et al.,* 2018; Middleton *et al., 2015*; Olmedo *et al., 2014*; Skuland *et al., 2015*; Theodoridis *et al.,2018*). Two studies (Kretowicz *et al.,* 2018; Moore *et al.,* 2018) were related to adoption of MedDiet and eight studies (Dijkstra *et al.,* 2015; Hardin-Fanning *et al.,* 2013; Middleton *et al., 2015*; Olmedo *et al., 2014*; Papadaki, *et al.,* 2015; Skuland *et al., 2015*; Theodoridis *et al.,2018*; Tong *et al.,* 2018) were related to adherence to MedDiet.

Sample sizes ranged from 11 participants (Middleton *et al., 2015*) up to 2000 participants (*Skuland et al., 2015*) for the qualitative studies and from 43 participants (Hardin-Fanning *et al.,* 2013) up to 12417 participants (Tong *et al.,* 2018) for the observational studies. Of the 10 included papers, four were published in 2018 (Kretowicz *et al.,* 2018; Moore *et al.,* 2018; *Theodoridis et al., 2018;* Tong *et al.,* 2018) and the rest six were published between 2013 and 2015 (Dijkstra *et al.,* 2015; Hardin-Fanning *et al.,* 2013; Papadaki, *et al.,* 2015; Middleton *et al., 2015*; *Olmedo et al., 2014*; *Skuland et al., 2015*). Four studies were conducted in United Kingdom (Kretowicz *et al.,* 2018; Middleton *et al., 2015*; Papadaki, *et al.,* 2015; Tong *et al.,* 2018) and one each in Greece (*Theodoridis et al., 2018*), the Netherlands (Dijkstra *et al.,* 2015), Northern Europe (Moore *et al.,* 2018), Norway (*Skuland et al., 2015*), Spain (*Olmedo et al., 2014*) and USA (Hardin-Fanning *et al.,* 2013). Two studies included females only (Kretowicz *et al.,* 2018 & *Olmedo et al., 2014*).

2.3.2 Findings of Included Studies

Eight factors were identified and categorized into themes as following: financial factors, cognitive factors, sociocultural factors, motivational factors, health & lifestyle factors, accessibility & availability factors, hedonic factors and demographic factors. The description of the main barriers and facilitators reported within each theme is featured in Table 3. The barriers and facilitators were inducted in categories hinging the nature of them. The data and factors extraction are being presented in the flow chart below.
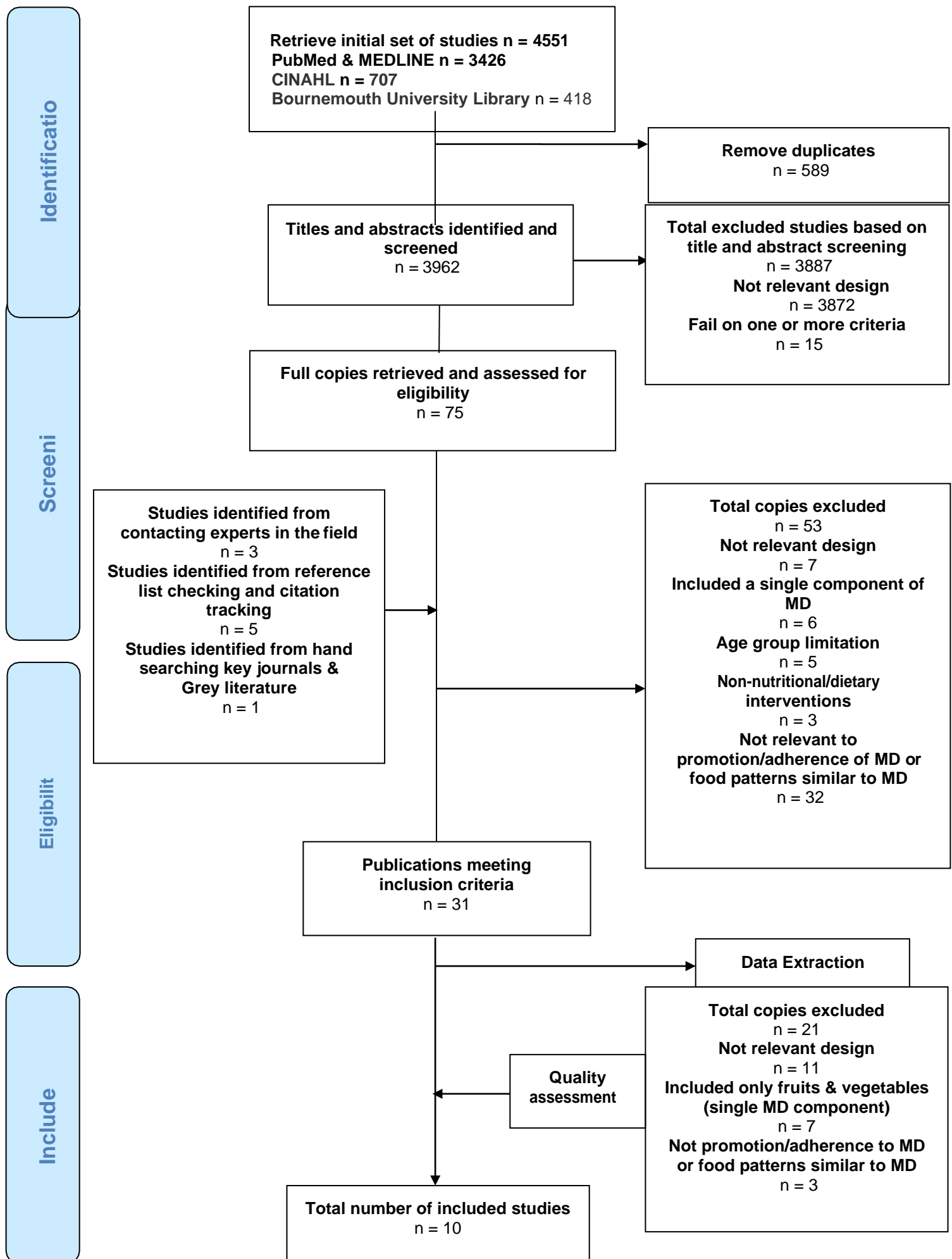
Figure 1. PRISMA Flow Diagram

Table 2. - Overview of included studies

Author(s)	Location	Aims	Participants	Data collection method	Quality[1,2,3]
Design: Observational studies					
Dijkstra *et al.,* 2015	The Netherlands	To identify barriers for meeting the fruit, vegetable and fish guidelines in older Dutch adults and to investigate socio-economic status (SES) differences in these barriers	n = 1057 Males and females 55–85 years	Questionnaire	22/22
Hardin-Fanning *et al.*, 2013	USA	To identify predisposing, reinforcing and enabling factors that affect adherence to a MedDiet in a rural Appalachian food desert	n = 43 Males and females aged ≥21 years	Questionnaire	20/22
Papadaki *et al.*, 2015	United Kingdom, England	To assess internet usage patterns and adherence to the MedDiet among employees in South West England, UK and their differences by personal characteristics	n = 590 Males and females mean age 43.8 years	Online survey	22/22
Tong *et al.*, 2018	United Kingdom, England	To examine the dietary cost associated with adhering to the MedDiet in the United Kingdom and to assess the extent to which this association is influenced by socio-economic factors	n = 12417 Males and females 30–65 years	Questionnaire	22/22

Design: Qualitative studies					
Kretowicz *et al.*, 2018	United Kingdom, England	To investigate the perceived barriers to following a MedDiet in women of childbearing age	n = 20 Females - aged 18–49 years	Focus groups	10/10
Moore *et al.*, 2018	Northern Europe	To investigate attitudes towards a MedDiet in individuals at high CVD risk in a Northern European population	n = 67 Males and females mean age 64 years	Semi-structured focus groups interviews, questionnaires	10/10
Middleton *et al.*, 2015	United Kingdom, England	To examine the participants' experiences regarding perceived barriers and facilitators which impact on consuming the MedDiet in the East of England	n = 11 Males and females aged 50–65 years	Semi-structured interviews	10/10
Olmedo *et al.*, 2014	Spain	To analyse the factors associated with the level of adherence to a Mediterranean dietary pattern in healthy Spanish women before pregnancy	n = 1175 Females - aged ≥18 years	Interviews, structured questionnaires	10/10
Skuland *et al.*, 2015	Norway	To investigate barriers to healthy eating by exploring the consumption patterns of fish & vegetables	n = 2000 Males and females aged 15-84 years	Nationwide web-survey	10/10
Theodoridis *et al.*, 2018	Greece	To associate MedDiet adherence and food insecurity among university students in Greece	n = 236 Males and females aged 19–30 years	Questionnaire	10/10

Guide
[1]Tools used for the overall methodological ratings of risk of bias
[2] For the appraisal of Qualitative studies: Critical Appraisal Skills Programme (2018). CASP Qualitative Checklist, [online] Available at: https://casp-uk.net/wp-content/uploads/2018/01/CASP-Qualitative-Checklist-2018.pdf. Accessed: 11/06/2019.
[3] For the appraisal of Observational studies: Hörnell A. *et al.* (2017) 'Perspective: An Extension of the STROBE Statement for Observational Studies in Nutritional Epidemiology (STROBE-nut): Explanation and Elaboration' (2017) *ADVANCES IN NUTRITION*, (5), p. 652. doi: 10.3945/an.117.015941.

Table 3. – Perceived Barriers and Facilitators to adoption or adherence to Mediterranean diet (MedDiet)

	Financial factors	Cognitive factors	Sociocultural factors	Motivational factors	Accessibility & availability factors	Health & lifestyle factors	Hedonic factors	Demographic factors
Barriers	-Too expensive food patterns (especially for young people) -Adhering to a MedDiet increases the overall food expenses of the household -MedDiet is more expensive than a western dietary pattern	-Lack of knowledge of how to incorporate the food components of the MedDiet into meals -Complex & contradictory dietary information (e.g. conflicting reports from media) -Absence of nutrition education (e.g. Limited knowledge of the health benefits of MedDiet foods) -Pesticides residues on food	-Not convenient to prepare and cook fresh food - Acceptability of a MedDiet: Difficulties in adapting a new eating pattern and changing personal established eating habits -Lower education level -Influence of family members -Stress, work and time pressures (e.g. irregular working hours) -Cultural differences (e.g. British culture has a tradition of eating a lot of red meat) -Perceived difficulty of living in a colder climate (e.g. some food patterns of MedDiet are being eaten cold and people prefer warmer foods)	-Lack of willpower / motivation to cook healthy foods -The term "diet" elicited ideas of restriction -Resistance to dietary change	-Difficult to purchase food items (e.g. little support to find and locate items in supermarket) -Seasonal influence and climate differences -Limited selection and choices -Easy to spoil (e.g. fruits and vegetables)	-Sedentary lifestyle -Habit of smoking	-Not liking the taste -Impractical to eat -Troubles with chewing fruits (especially in older adults) -Components of the diet were unappealing (e.g. lentils) -Finding hard to give-up liked foods	Age-related -Younger people were concerned about the expensiveness of MedDiet food pattern Gender-related -Males' populations were less likely to understand the health implications of adhering to a MedDiet -Males' populations were not so amendable to making dietary changes as females

	Financial factors	Cognitive factors	Sociocultural factors	Motivational factors	Accessibility & availability factors	Health & lifestyle factors	Hedonic factors	Demographic factors
Facilitators	-Higher household income	None reported	-Broaden the food repertoire -Redefining cultural eating habits -Upbringing and family -Values around food -Cooking skills (in elderly people) -Higher education attainment -Higher social class (in women) -Being married or cohabiting -Shared responsibility of food preparation	None reported	None reported	-Better quality of food -Physical and psychological benefits -Disease prevention	-Enjoyable and pleasurable experience (sense of pleasure and fulfilment to meal times)	Age-related -Older people were more likely to adapt the MedDiet because of their knowledge in cooking Gender-related -Women's' higher social class was correlated with higher probability to adopt MedDiet

[30]

2.4 Discussion

The present research aimed to systematically summarise, analyze and assess findings of recent published observational and qualitative studies that investigated the enabling factors and apparent obstacles amongst healthy adults when attempting to adopt and adhere to a MedDiet. The synthesis of perceptions of adults' self-reported barriers and facilitators to adopting and adhering to a Mediterranean dietary pattern will help to build a more thorough understanding and will lead eventually to the development of novel and pragmatic future interventions to improve adoption and adherence to Mediterranean style diet on healthy populations outside Mediterranean regions.

2.4.1 Sociocultural background

The systematic synthesis of studies documented factors that influence both negatively and positively the adoption to a MedDiet, such as the sociocultural background. Sociocultural factors, like time pressures (Middleton *et al., 2015*), were reported to act as barriers to adoption of MedDiet. This is corroborated from other similar studies in perceived personal barriers to healthy eating, where lack of time was reported as barrier to follow a healthy diet (Inglis *et al.*, 2004). Furthermore, participants' perspectives indicated in the difficulty to adapt a new eating pattern and change their normal routine eating habits and traditions were highlighted as possible barriers in our findings and this is consistent with previous research on the perceived difficulty of the transferability of the MedDiet to non-Mediterranean countries (Miguel Ángel Martinez-Gonzalez *et al.,* 2018). Literature suggests that people of lower socioeconomic status are less likely to eat healthily and more likely to smoke compared to those of higher and this correlation has been reported as well by a recent study in adults from Germany, which showed that high level of education was the most pronounced socio-economic indicator of high diet quality (Schoufour *et al.*, 2018). Furthermore, other results that have been documented in previous research shown that the lowest educated individuals were more likely to be non-cooks than those with the highest education levels (Méjean *et al.,* 2017).

2.4.2 Accessibility and availability to resources

Recent research highlighted that the lack of healthy food choices, the irregularity of food supply and the difficulty of preparing fresh food due to lack of cooking skills could possibly act as barriers to increase the consumption of a healthy diet (Kihlström & Himmelgreen, 2019). It is reported also, that there is limited access to a range of MedDiet components in shops and supermarkets (Ashton *et al.,* 2017), which makes accessibility to MedDiet's components more difficult.

2.4.3 Financial restraints

One of the most frequently perceived barriers that were documented through the overall data extraction from the studies was the perceived high cost of MedDiet's components (Middleton *et al., 2015*). The price of food is reported to be a barrier that influences healthy eating (Lopez *et al.,* 2009) and this is in accordance with results that have been documented by other authors where higher household income was linked positively with higher diet quality in adults (Aggarwal *et al.*, 2011) and lower household income has been consistently associated with poorer diet quality (French *et al.*, 2019). The results of systematic synthesis revealed that high cost is an important barrier in food consumption into young adults' populations (Hardin-Fanning *et al.,* 2013) and a recent study in young adults reported that their financial instability leads to the consumption of unhealthy diets, as healthier diets or dietary patterns closer to dietary guidelines are more expensive (Munt *et al.,* 2016). An interesting difference was revealed between the synthesis of the present research and a study which was implementing a MedDiet intervention. In the present research, the synthesis of participants' perceptions documented that adherence to MedDiet increases the overall food expenses of the household (Middleton *et al.,* 2015), which supports previous evidence from a MedDiet intervention group, in which higher costs were associated with the consumption of key MedDiet's components (Rydén *et al.,* 2008). On the contrary, a nutritional intervention promoting a Mediterranean food pattern in North America has shown that there is negative association between adherence to MedDiet and the increase of daily food expenses (Goulet *et al.,* 2008).

2.4.4 Demographic factors: Age & Gender

Participants' age-related differences across the studies synthesis highlighted some interesting information relevant to the adoption of the MedDiet. On the one hand, younger people were reported to be more concerned about the financial restraints and the expensiveness of MedDiet food pattern (Hardin-Fanning *et al.,* 2013), and from the other hand older populations were less likely to report high cost as an obstacle (Ashton *et al.,* 2017). Older people was documented in literature also to be more likely to adapt the MedDiet because of their knowledge in cooking (Lara *et al.,* 2014), contrariwise to younger populations, in which it was reported that dietary deviation from traditional MedDiet was increased the last few years (Iaccarino *et al.*, 2017; Theodoridis *et al.*, 2018). Gender-related differences were spotted as well across the included studies. Women were more likely to report an understanding of the health impact of certain foods (Hardin-Fanning *et al.*, 2013) and their higher social class was correlated with higher probability to adopt MedDiet (Olmedo *et al.*, 2014). On the other hand, males' populations were documented to be less likely to understand the health implications of adhering to a MedDiet (Hardin-Fanning *et al.*, 2013) and they were not so amendable to making dietary changes as females (Moore *et al.*, 2018; Wardle *et al.*, 2004). Age-related barriers were documented also for older adults, who reported to face loss of appetite (Dijkstra *et al.,* 2015).

2.4.5 Hedonic factors

The literature review of the included studies revealed that hedonic factors were most likely to act as obstacles to adopt and adhere to a Mediterranean style diet. It is reported that people experienced troubles with chewing MedDiet's food patterns, they found impractical to eat them or simply they disliked MedDiet's food components (Dijkstra *et al.*, 2015). Similar results to barriers to healthy eating were reported in obese young men, which were more likely to report disliking the taste of healthy foods as a key barrier to follow a healthy eating life (Ashton *et al.*, 2017). Another apparent obstacle to following MedDiet was the components of the diet, which were reported to be unappealing (e.g. legumes and lentils) (Kretowicz *et al.,* 2018). Literature (Lara *et al.,* 2014) also suggests that giving-up liked foods is one major barrier to follow a diet and this is corroborated with habits, emotional attachments, stress-relief effects and fear of not being acceptable by the close friends.

2.4.6 Cognitive factors

The synthesis of studies documented that conflicting media information was one of the obstacles which discourage people from following advice and making dietary changes towards a MedDiet (Moore *et al*., 2018). Similar results have been reported by other studies, where greater expose to contradictory information reported greater levels of nutrition confusion and confusion was associated with greater nutrition backlash. Confusion and backlash were negatively associated with intentions to engage in healthy lifestyle behaviours (Nagler, 2014).

2.4.7 Lifestyle factors

Sedentary lifestyle and smoking habit were highlighted as barriers to adherence to MedDiet (OImedo *et al*., 2014) and this is consistent with previous research where positive correlations between smoking habit and unhealthy dietary behaviour have been documented (Arabshahi *et al.,* 2011). Contrariwise other literature findings reported that there is no relationship between quality of diet and smoking prevalence (Moreno-Gómez *et al*., 2012), which make this influencing factor open for a future investigation.

2.4.8 Motivational factors

Lack of willpower was reported to act as barrier to adoption of MedDiet (Lara *et al.,* 2014). This is corroborated from other similar studies in perceived personal barriers to healthy eating, where lack of motivation was reported as barrier to follow a healthy diet (Inglis *et al*., 2004). Furthermore, resistance to dietary change has been found to be barrier against MedDiet's adoption (Moore *et al*., 2018) and this is in accordance to reports that dietary changes could be difficult to effect both at an individual and at a population level, and even when changes do occur they are often far slower and less pronounced than might be expected (Shepherd, 2002).

2.4.9 Future recommendations

The current synthesis of studies did not reveal any notable differences between UK and the countries of the rest of the world, as peoples' reported perceptions on factors that influence adherence to MedDiet were similar. The creation of supporting programmes that decrease the cost and increase the supply of high-quality fruits and vegetables in low-income communities and places with low accessibility to Mediterranean food patterns should be taken under consideration for future interventions. Educational programmes for expanding the knowledge on MedDiet's positive health effects and presentation of cooking ideas which incorporate the MedDiet's food components could also be used for possible future nutrition interventions.

2.4.10 Strengths and limitations

Strengths of the systematic review

This study provides a comprehensive synthesis of qualitative and observational evidence about adults' perceptions on following and adhering to a MedDiet. The 10 studies represent over twenty-five thousand men's and women's perceptions and experiences. Our findings included data from nine different countries and the studies reflect what has been reported in the literature as early as 2013. Screenings of articles and data collection were performed by two authors (DV and FT).

Potential biases in the review process

The following validity threats were identified during the systematic literature review. The review focused only on healthy adults, and as a result the findings may not be transferable to non-healthy and underage populations. Further tools for assessing the unpublished studies may have been useful. Additionally, this systematic review is limited to analyze data and information from studies provided only in English language, and as a result the Tower of Babel bias is introduced (Ioannidis & Lau, 1999).

2.5 Conclusion

Findings from the current synthesis of studies provide insight into the factors that can influence adoption of and adherence to MedDiet in healthy adults globally. The factors that were documented were: financial, sociocultural, hedonic, motivational, demographic, cognitive, factors related to access to facilities and resources and perceptions related to health and quality of life. The reported barriers and enablers to adoption and adherence to MedDiet could be considered in future development of nutrition interventions to promote Mediterranean style diet in United Kingdom. Motivational factors, cognitive/knowledge factors and availability factors were only linked with negative influence towards MedDiet and no reports were documented that linked these factors with positive influence to MedDiet's adoption or adherence. There is lack of evidence and further investigation is needed on the above factors, in order to create a more thorough understanding around the enabling factors that affect Mediterranean diet's adoption and adherence.

CHAPTER III
A pilot survey to investigate factors that influence adoption of and adherence to Mediterranean style diet in healthy adults who live in England

Abstract

Background: Following a Mediterranean style diet outside Mediterranean regions has been documented as difficult. One of the currents challenges is to investigate what are the factors that might influence adoption of and adherence to a Mediterranean style diet in healthy adults who live in England.

Methods: In this pilot cross-sectional study, a sample of 45 healthy adults who live in UK, took part anonymously. Research Ethics Committee of Bournemouth University approved the study protocol. Data were collected using one self-reported online questionnaire with three sections: Mediterranean Diet Adherence Screener (MEDAS) score; influencing factors of MedDiet's adoption or adherence; and demographic information. Data were analyzed using Spearman's correlation coefficient test in SPSS ($\alpha < 0.05$).

Results: The total MEDAS score was found to be below moderate level (5.8 ± 2.7). British citizens' MEDAS scores had significant positive correlations with the influence of family members and their upbringing ($r = 0.35$, $p = 0.03$). The smoking habit was found to be inversely correlated with adoption of MedDiet among the participants ($r = 0.37$, $p = 0.02$). None of the factors related to adherence to MedDiet was found to have statistical significance.

Conclusion: It is recommended that nutrition professionals focus more on Mediterranean diet's influential factors in order to investigate potential future interventions. If our findings are confirmed in future studies, nutrition professional managers can consider the development of nutritional interventions based on the influencing factors, as one of the managerial approaches for promoting a Mediterranean style diet outside Mediterranean regions.

Keywords: Mediterranean diet, adoption, adherence, barriers, facilitators, adults, pilot study, questionnaire

3.1 Background

Little is known about the pragmatic perspectives of adopting or adhering to the MedDiet in non-Mediterranean countries and the concept of how British citizens are being influenced from various factors into their daily lives is seeking further investigation. This study addresses this gap and highlights the influential power of various barriers and facilitators to adopting or adhering to the MedDiet, based on a small sample of British citizens.

Irregular working hours, finding hard to give-up liked foods (Lara *et al.,* 2014) and conflicting media information (Moore *et al.*, 2018), were documented as factors that could possibly influence negatively MedDiet's adoption and discourage people from following advice and making dietary changes. On the other hand, many studies revealed that there are various factors which positively could influence MedDiet's adoption or adherence (Lara *et al.,* 2014; Papadaki, *et al.,* 2015; Mc Morrow *et al.*, 2017). For instance, data from the Scottish Health Survey (SHeS) were analyzed and it was reported that healthy lifestyle behaviours such as not smoking, meeting the exercise guidelines and lower alcohol consumptions were significantly associated with meeting the recommended MedDiet intakes (Mc Morrow *et al.*, 2017). Additionally, being married, cohabitating or sharing responsibility of food preparation was positively correlated with higher adherence to MedDiet (Papadaki, *et al.,* 2015).

Conceptual framework and aim of the study

By understanding the influencing factors most related to adoption of or adherence to MedDiet in a sample of healthy adults who live in England, interventions could target those factors of greatest potential impact on MedDiet adoption or adherence. This project was undertaken with a view to recommending future interventions, or areas for intervention, where these recommendations would be based on an increased understanding of root causes. To the best of our knowledge, this is the first attempt to investigate the relationship between the MEDAS scores and the influencing factors of adoption to or adherence of MedDiet in residents to England. Whilst there are no immediate benefits for those people participating in the completion of this questionnaire study, it is hoped that this work will provide us with valuable information, which after analysis, will expand our knowledge in the influencing factors of adoption of or adhering to a Mediterranean style diet.

Therefore, the main objectives of this study are:

• Exploring the influence of various factors that might play key role in the adoption of or adherence to a Mediterranean style diet between people who live in England

• Exploring the relationship between participants' MEDAS scores and Mediterranean diet's related influencing factors in England's adult residents'

3.2 Research methods and procedures

3.2.1 Study design & setting

This was a pilot cross-sectional survey using descriptive correlational design to investigate the association between the influencing factors of MedDiet's adoption or adherence and the Mediterranean adherence scores (MEDAS) from UK's healthy residents adults. The survey was conducted online between April-May 2020. The conduction of Chapter's II SLR, provided the starting point for the beginning of the pilot questionnaire survey. The themes which were emerged have been analyzed into subthemes and they were used for the development of closed type questions, which were included into the pilot online questionnaire.

3.2.2 Participants & sample

Recruitment strategy and questionnaire administration

The questionnaire was disseminated through social media (Facebook, twitter and BU research blog). Every post in social media included the created survey flyer, which was including a QR-code for making easier the recruitment of volunteered participants. The QR-code could be scanned via mobile phone and transfer participants directly to the online questionnaire form to fill in. The anonymous questionnaire survey was launched online in April 2020 and answers were collected until the end of May 2020.

Sample size calculation

Based on previous similar work on barriers and facilitators of the consumption of specific food groups, a sample size of 300-500 participants from across the UK is anticipated for a larger full study (Appleton, 2016). For the purpose of this project, an online questionnaire study has been conducted and the sample size of this study should have been 10% of the sample projected for the larger full study (Connelly, 2008). This means that this pilot study aimed to collect questionnaires from around 30-50 participants.

Ethical approval

Ethical approval for the study was gained prior to commencement from the Research Ethics Committee of Bournemouth University, and then, pilot questionnaire study was launched online. Jisc Online survey tool (an online survey tool designed for Academic Research, Education and Public Sector) was used for questionnaire's distribution. Finally, according to the exclusion criteria, questionnaires of 45 participants were analyzed (response rate = 68.18%).

Eligibility criteria

Participants in order to be eligible to take part in the survey should have been able to meet all the inclusion criteria listed below:

Eligibility criteria
(1) Healthy adults aged over 18 years old who live in England
(2) NOT suffering from any food intolerance or food allergies (e.g. gluten intolerance, or any food allergy)
(3) NOT have any chronic disease (e.g.: Hypertension, Cardiovascular disease, Diabetes, Renal or Liver disease, Cancer, etc…) that may affect their diet/appetite
(4) NOT take any medication that affects their appetite
(5) NOT following a specific diet due to illness
(6) NOT coming from a Mediterranean country (Greece, Spain, Albania, Italy, Gibraltar, France, Monaco, Malta, Slovenia, Croatia, Bosnia & Herzegovina, Montenegro, Turkey, Cyprus, Lebanon, Israel, Syria, Palestine, Egypt, Libya, Tunisia, Algeria, Morocco)

3.2.3 Measures

Data were collected using one online questionnaire. The questionnaires were filled and submitted online. In the first page of the online questionnaire there was a Participant Agreement Form. Participants read the statements and either gave their consent to participate in the survey or not. The statements included that they have read and understood the Participant Information Sheet. In addition, potential participants were asked to complete the eligibility criteria, before giving their consent to take part in the survey. After giving their consent they were redirected into the MEDAS score measurement section. Firstly, the questionnaire assessed current MEDAS score of each participant. Secondly, the factors associated with adoption of or adherence to Mediterranean style diet were scored based on a seven-point Likert scale, and finally, various participants' demographic and lifestyle characteristics were collected in order to investigate eventual impact on adoption or adherence to MedDiet in healthy adults who live in England. Conjunctions between intakes and barriers and facilitators of importance were subsequently determined by correlation analysis.

Mediterranean diet adherence

The appraisal of participants' adherence to MedDiet was assessed through Mediterranean Diet Adherence Screener (MEDAS), which is a validated 14-item questionnaire (Martínez-González *et al,* 2012). MEDAS questionnaire was asking for the frequency of consumption of the 14 Mediterranean foods. Response options were: "less than two", "less than one", "1", "1 to 2", "2 or more", "1 to 3", "3 to 5", "3 or more", "4 to 6", "4 or more", "6 or more", "7 or more", "YES" and "NO", and were scored: 1 and 0, respectively, to provide the total MedDiet score for each participant. The food items included in the questionnaire were relevant to the traditional Mediterranean diet, and the response format was taken from a validated FFQ (Martínez-González *et al,* 2012). In the end of the MEDAS score measurement, participants were asked to respond if they are currently adhering to MedDiet or not, and based on their answers they were redirected either to adoption related factors section neither to adherence related factors section, in order to answer the questions.

Barriers to and Facilitators of adopting or adhering Mediterranean style diet

Barriers and facilitators were assessed by requesting participants to agree or disagree with statements citing to various aspects of adoption of or adherence to MedDiet. These statements were composed following the identification of 8 themes from analyses of the Systematic Literature Review. These themes related to liking; taste; appearance; freshness; quality; accessibility; availability; cost; convenience; health; lifestyle; knowledge; cohabitation; spoilage and waste; media reports, and habits. For seventeen (17) themes, there were provided two statements in order to minimize bias, e.g., for the theme of hedonics — "I find legumes such as lentils unappealing" and "I find legumes such as lentils palatable" — and for the theme of lifestyle —"I find it difficult to eat less red meat due to British food culture" and "I am able to eat less red meat due to British food culture". Participants responded statements on a Likert Scale of seven points – (from strongly disagree = 1 to strongly agree = 7) – "strongly disagree", "moderately disagree", "slightly disagree", "neither agree nor disagree", "slightly agree", "moderately agree", "strongly agree". The options "strongly agree" and "slightly agree" are considered as positive responses, while "strongly disagree" and "slightly disagree" are considered as negative responses. Participants were asked to only complete the responses that best characterized how they felt about the statement. The final section of the survey was the completion of participants' demographic and lifestyle characteristics.

Demographic and Lifestyle Characteristics

Demographic characteristics have been assessed by direct questioning participants': age; gender; income; marital status; educational level; smoking status; UK residency duration; and ethnicity. Lifestyle characteristics assessed were: Height and body weight based on self-reported; Waist circumference based also on self-reported measurements. All demographic and lifestyle variables have previously been associated with adoption of or adherence to Mediterranean style diet in adults (Wardle *et al.*, 2004;Arabshahi *et al.,* 2011;Hardin-Fanning *et al.,* 2013;Lara *et al.,* 2014;Olmedo *et al.*, 2014;Iaccarino *et al.*, 2017;Moore *et al.*, 2018;Theodoridis *et al.*, 2018).

3.2.4 Piloting the questionnaire

The validity and reliability of the newly designed online questionnaire was improved by a pilot study, which followed the procedures described by a guide for pilot studies (Van Teijlingen and Hundley 2001). The questionnaire was administered to pilot subjects in the same way as it was administered in the main study. The pilot subjects were six (6) British adults, aged between 20-55 years old and they have been asked for feedback to identify ambiguities and difficult questions. The subjects had read carefully each question. The time taken to complete the questionnaire has been recorded and decided whether it is reasonable in order to ensure that it will take around 20–30 min to complete. The selected questions that the pilot subjects found either ambiguous or undefined, there have been modified or discarded. Through this pilot study it was examined if responses can be interpreted in terms of the information that is required and whether each question could give an adequate range of responses. Some questions had lack of clarity as they were written only based on Continental measuring standards or there were some small language mistakes. For instance, weight and height self-reports were initially asked only as kilograms (kg) and centimeters (cm) respectively. After conducting the pilot study, the questions were updated in order to include the UK measurement style as well: inches for height report and pounds for weight report.

3.2.5 Data analysis

Data were first analyzed using descriptive and analytical tests in SPSS version 17. All tests were two-tailed, and the significance level was set at 0.05. For descriptive variables, statistical indices, such as frequency, percentage, mean (average), and standard deviation (SD), were measured to assess the participants' demographic information and scores of MEDAS questionnaires. Pearson's (Sedgwick, 2012) and Spearman's (Sedgwick, 2014) correlation coefficient tests were used as analytical tests, for normally and not normally distributed data respectively. Pearson's and Spearman's rank correlation coefficient were performed to investigate the associations between MEDAS scores & the factors that tend to influence adoption of or adherence to MedDiet across the healthy adult participants of the survey. Chi squared tests were used for categorical variables to compare MEDAS scores in relation to demographic characteristics.

Ethical considerations

The ethical considerations of the study included anonymity of the questionnaires and maintaining the confidentiality of information. In addition, approval was obtained from the ethics committee, and informed consents were submitted online from the participants. The questionnaires were used after obtaining the required permissions.

3.3 Results

The results showed that the total score of Mediterranean diet adherence was below moderate level. In addition, the results showed a significant positive correlation between MEDAS score and factors related to MedDiet adoption and adherence respectively. Although these correlations were not strong, they were statistically significant. On the other hand, other results indicated negative correlations between MEDAS score and factors related to MedDiet adoption and adherence respectively. The correlations were not strong, and only one factor related to adherence to MedDiet was statistically significant.

3.3.1 Respondents

Table 4. General demographic characteristics (Means ± SD)[1] or (Median, IQR)[2] (n=45)

General demographic characteristics	Totals (n=45)
Age[1] (years)	33.7 ± 10.2
BMI[2] (kg/m^{2})	25.5 (IQR=33.5)
Marital status	
Single/Divorced, (%)	20, (44.4%)
Married/Living with partner, (%)	25, (55.6%)
Smoking status	
Current smokers, (%)	6, (13.3%)
Never smoked / Ex-smoker, (%)	39, (86.7%)
Educational level	
Primary or less, (%)	1, (2.2%)
Secondary, (%)	5, (11.1%)
Higher, (%)	39, (86.7%)
Ethnicity	
White, (%)	34, (75.6%)
Asian / Pacific Islander, (%)	5, (11.1%)
Black or African American & Hispanic or Latino & Other, (%)	6, (13.3%)
MEDAS score[1] (points)	5.8 ± 2.7

[1,2] Means ± SD were used for normally distributed data and Median & IQR were used for not normally distributed data. The sample has a median BMI of 25.5 kg/m^{2} and IQR = 33.5 kg/m^{2} (range min: 16.9 – max: 33.8 kg/m^{2}) and a mean age of 33.7 ± 10.2 years (range min: 22 – max: 56). MEDAS mean score was 5.8 ± 2.7 points (categories: lowest ≤5, average to high ≥6).

3.3.2 `Mediterranean diet adherence

Table 5. Response frequency of dietary components included in the MEDAS questionnaire of the participants n=45

	Questions	n=45	%
1	Use of olive oil as main culinary fat (Yes)	33	73.3%
2	Extra virgin olive oil >4 tablespoons/day	5	11.1%
3	Vegetables ≥2 servings/day	25	55.5%
4	Fruits ≥3 servings/day	8	17.8%
5	Red/processed meats <1 serving/day	26	57.8%
6	Butter, margarine or cream <1 serving/day	28	62.2%
7	Sweet or carbonated beverages <1 serving/day	28	62.2%
8	Wine glasses ≥7/week	3	6.7%
9	Legumes ≥3 servings/week	14	31.1%
10	Fish or shellfish ≥3 servings/week	7	15.5%
11	Commercial sweets or pastries <3 times/week	20	44.4%
12	Nuts (including peanuts) ≥3 servings /week	11	24.4%
13	Preferentially consume poultry more than red meats	24	53.3%
14	Use of sofrito sauce ≥2 servings/week	31	68.9%

Table 2 results are indicating that using of extra virgin olive oil in a daily basis, drinking a lot of red wine, and eating fruits were documented with the lowest frequencies (<18%) in our sample of British citizens (n=45). Although, the majority (73.3%) of participants reported that they are using olive oil as main culinary fat. Using sofrito sauce, drinking sweet or carbonated beverage, and using butter or margarine were documented with the highest frequencies (>62%) in our sample.

Table 6. Participants' adherence to categories (lowest, average to high) of the Mediterranean diet (MedDiet) based on Mediterranean diet adherence screener (MEDAS) scores, and in relation to demographic characteristics

Adherence to MedDiet	≤5 Lowest	≥6 Average to High	Chi-square & P-value
n	22	23	
Age (years)*	33.3 ± 9.1	34 ± 11.3	
BMI (kg/m^2) *	26.2 ± 4.7	24.7 ± 3.7	
			Chi-square & P-value
Smoking**			$\chi^2 = 0.67$ p = 0.41***
Current smokers, (%)	2, (9%)	4, (17%)	
Never smoked / Ex-smoker, (%)	20, (91%)	19, (83%)	
Marital status**			$\chi^2 = 0.53$ p = 0.46***
Single/Divorced, (%)	11, (50%)	9, (39%)	
Married/Living with partner, (%)	11, (50%)	14, (61%)	
Educational levels**			$\chi^2 = 4.49$ p = 0.03****
Primary and Secondary, (%)	6, (27%)	1, (4%)	
Higher, (%)	16, (73%)	22, (96%)	

*Means ± SD unless otherwise stated.

**Chi squared tests (categorical variables).

***No statistical significance at p<.05.

****Educational levels of participants were documented to have positive correlation with MEDAS scores,
 Statistical significance at p<.05.

Table 7. Likert scale's averages and ranges of participants' perceptions of the influencing factors related to adoption of Mediterranean style diet (Factors are presented from the most influential to the least influential ones according to participant's answers, n=35).

Factors related to adoption of MedDiet	Average score of Likert scale (max=7)[1]	Range of answers (min: 1 - max: 7)
Difficulty to give-up liked foods prevents adoption	5.46	4 (3-7)
Knowing how to cook MedDiet's recipes helps adoption	5.23	4 (3-7)
Physical health benefits awareness helps to adopt	4.80	4 (3-7)
Personal overall healthy lifestyle helps adoption	4.71	4 (3-7)
Family members & upbringing are helping adoption	4.63	4 (3-7)
Perception that MedDiet leads to disease prevention is helping adoption	4.54	6 (1-7)
Awareness of psychological benefits helps to adopt	4.42	4 (3-7)
Term "diet" elicits ideas of restriction	4.31	6 (1-7)
British food culture differences are preventing adoption	4.20	6 (1-7)
Media's reports are helping adoption	4.11	4 (2-6)
Difficulty to consume cold recipes of MedDiet	4.08	5 (1-6)
Time consuming preparation & cooking prevents adoption	4.05	6 (1-7)
Finding legumes unappealing	3.71	6 (1-7)
Sedentary lifestyle prevents adoption	3.65	4 (2-6)
Obligation to eat less red meat makes adoption difficult	3.60	6 (1-7)
Complex & contradictory dietary information prevents adoption	3.48	5 (1-6)
Smoking habit prevents adoption	3.08	4 (1-5)

[1]Participants responded statements on a Likert Scale of seven points – "strongly disagree" = 1, "moderately disagree" = 2, "slightly disagree" = 3, "neither agree nor disagree" = 4, "slightly agree" = 5, "moderately agree" = 6, "strongly agree" = 7. Any scores <4 are indicating that participants' tendency is to disagree with the statement, scores = 4 is an indication that participants' neither agree nor disagree with the statement, and scores >4 are indicating that participants' tendency is to agree with the statements related to the influence of the factors in MedDiet's adoption.

Table 8. Likert scale's averages and ranges of participants' perceptions of the influencing factors related to adherence to Mediterranean style diet (Factors are presented from the most influential to the least influential ones according to participant's answers, n=10).

Factors related to adherence to MedDiet	Average score of Likert scale (max=7)[1]	Range of answers (min: 1 - max: 7)
Ability to buy MedDiet foods helps adhering	6.1	4 (3-7)
The range of MedDiet's foods in shops helps adhering	5.9	3 (4-7)
Broaden food repertoire helps adhering	5.9	5 (2-7)
Being married or cohabitating helps adherence	4.1	6 (1-7)
Prevented from irregular working hours	3.2	6 (1-7)
Limited variety of foods prevents adherence	3.2	5 (1-6)
Quick spoilage of certain MedDiet's foods prevents	3	5 (1-6)
Lack of motivation to cook prevents adherence	2.9	6 (1-7)
Overall food expenses preventing from adhering	2.6	5 (1-6)
Adherence is prevented from lack of knowing how to incorporate MedDiet's foods	2.4	5 (1-6)
Shared responsibility of food preparation prevents	2.4	5 (1-6)
Pesticides on foods preventing from adhering	2.3	5 (1-6)
Living alone prevents adhering	2.1	5 (1-6)
Lack of knowledge of the health benefits is preventing adherence	1.9	4 (1-5)
Troubles with chewing components prevents	1.8	4 (1-5)

[1]Participants responded statements on a Likert Scale of seven points – "strongly disagree" = 1, "moderately disagree" = 2, "slightly disagree" = 3, "neither agree nor disagree" = 4, "slightly agree" = 5, "moderately agree" = 6, "strongly agree" = 7. Any scores <4 are indicating that participants' tendency is to disagree with the statement, scores = 4 is an indication that participants' neither agree nor disagree with the statement, and scores >4 agree are indicating that participants' tendency is to agree with the statements related to the influence of the factors in MedDiet's adherence.

Table 9. Outcomes of the correlation analyses investigating the impact of the questions related to adoption of MedDiet and participants' MEDAS scores & Likert scale answers

Questions related to to adoption of MedDiet	Correlation coefficient[1,2]	P-value
Smoking habit prevents adoption	0.37	**.02***
Family members & upbringing are helping adoption	0.35	**.03***
Perception that MedDiet leads to disease prevention is helping adoption	0.14	.39
Personal overall healthy lifestyle helps adoption	0.10	.56
Physical health benefits awareness helps to adopt	0.08	.63
Knowing how to cook MedDiet's recipes helps adoption	0.06	.69
Media's reports are helping adoption	0.06	.72
Awareness of psychological benefits helps to adopt	0.05	.75
Time consuming preparation & cooking prevents adoption	- 0.03	.86
Term "diet" elicits ideas of restriction	- 0.06	.72
Difficulty to give-up liked foods prevents adoption	- 0.10	.56
British food culture differences are preventing adoption	- 0.10	.53
Complex & contradictory dietary information prevents adoption	-0.19	.25
Finding legumes unappealing	- 0.23	.18
Obligation to eat less red meat makes adoption difficult	- 0.26	.12
Difficulty to consume cold recipes of MedDiet	- 0.28	.10
Sedentary lifestyle prevents adoption	- 0.31	.06

[1,2]Pearson's correlation coefficient and Spearman's rank correlation coefficient were used for normally and not normally distributed data respectively.

*Questions with statistical significance at p<.05

Table 10. Outcomes of the correlation analyses investigating the impact of the questions related to adherence to MedDiet and participants' MEDAS scores & Likert scale answers

Questions related to adherence of MedDiet[*]	Correlation coefficient[1,2]	P-value
Ability to buy MedDiet foods helps adhering	0.60	.06
Broaden food repertoire helps adhering	0.41	.23
The range of MedDiet's foods in shops helps adhering	0.21	.55
Being married or cohabitating helps adherence	0.12	.72
Shared responsibility of food preparation prevents	- 0.27	.44
Lack of motivation to cook prevents adherence	- 0.31	.38
Overall food expenses preventing from adhering	- 0.32	.35
Prevented from irregular working hours	- 0.34	.33
Limited variety of foods prevents adherence	- 0.35	.30
Living alone prevents adhering	- 0.38	.30
Lack of knowledge of the health benefits	- 0.39	.25
Quick spoilage of certain MedDiet's foods prevents	- 0.42	.22
Troubles with chewing components prevents	- 0.48	.15
Pesticides on foods preventing from adhering	- 0.58	.07
Adherence is prevented from lack of knowing how to incorporate MedDiet's foods	- 0.60	.06

[1,2]Pearson's correlation coefficient and Spearman's rank correlation coefficient were used for normally and not normally distributed data respectively.

*No questions were found to have statistical significance at p<.05

3.4 Discussion

The main goal of this study was to measure adherence of the Mediterranean diet and its relationship with influencing factors from the British citizens' point of view. Our findings indicated that Mediterranean diet adherence was at moderate level. This is in accordance with previous findings from studies in UK, where it was reported that the typical UK's diet consumed by adults is low in fruits and vegetables, legumes, oily fish and whole grains, and high in saturated fat and sugar which is considerably different to a Mediterranean style diet (Bates *et al.,* 2016). Also, our participants' median BMI was 25.5 (overweight), which is similar to reports from a previous study, which reported that nearly 63% of adults in England were classed as being overweight (a body mass index of over 25) or obese (a BMI of over 30) (Fuller *et al.,* 2016). Many of our participants' perceptions towards various influencing factors were not following the existing literature from previous studies, which conducted either inside or outside Mediterranean regions. Many of our participants did not have an opinion on the questions they were asked to complete on the survey. For instance, they did not have opinion for the irregular working hours as an obstacle from following the MeDiet, despite that literature suggests that irregular working hours (e.g. working at night shifts) had negative impact in the adoption of and adherence to MedDiet (Lara *et al.,* 2014; Theodoridis *et al., 2018*). Same situation was observed for other questions like the possible influence of complex & contradictory dietary information or the effect of term "diet" as a factor that elicits ideas of restriction to people. Another objective of this study was to examine the relationship between MedDiet's influencing factors and participants' MEDAS scores. Our findings documented that MEDAS scores had significant positive correlations with various specific factors related to adoption of MedDiet. Finally, educational levels are likely to be linked to MedDiet's adherence. Higher educational level was previously associated with a higher level of adherence to the Mediterranean diet (Olmedo-Requena *et al.,* 2014) and in our study these associations were also confirmed as the highest adherence scores were found to those with higher educational levels. Educational levels of our participants were documented to have statistical significance at p<.05 with MEDAS scores ($\chi^2 = 4.49$, p = 0.03)

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Factors related to adoption to MedDiet - Comparison with Other Studies

Two factors related to adoption of MedDiet were positively correlated with higher MEDAS scores among the British citizens of our study. Family members influence and participants' upbringing was positively correlated with higher adoption of MedDiet. Although this correlation was not strong, it was statistically significant ($p<0.05$), and consequent with a qualitative study in UK, which elucidated that the upbringing and family values and practices around food was highlighted to be an enabler to following a Mediterranean style diet (Kretowicz *et al.,* 2018). The smoking habit was found to be preventing adoption of MedDiet among our participants and this result was statistically significant ($r = 0.37$, $p = 0.02$). Similarly, (OImedo *et al.*, 2014) highlighted smoking habit as barrier to adherence to MedDiet. On the other hand, other literature findings reported that there is no relationship between quality of diet and smoking prevalence (Moreno-Gómez *et al.*, 2012). As far as, the rest of the factors related to adoption of MedDiet was not observed any statistical significance, but only some tendencies of the participants.

Factors related to adherence of MedDiet - Comparison with Other Studies

None of the factors related to adherence to MedDiet was found to have statistical significance. Two factors documented with p-value around .06, and even though they were not statistically significant, they might show some tendencies which can be investigated further in a bigger study. Firstly, participants' tendencies reported that ability to buy MedDiet foods ($r = 0.60$, $p = 0.06$) helps them adhering to MedDiet and that knowing how to incorporate MedDiet's foods into recipes ($r = -0.60$, $p = 0.06$). The overall food expenses were not reported as prominent barrier for adherence among participants of this study as they did not either agree or disagree. This may be explained by the relatively low cost of many foods in the MedDiet eating pattern (Drewnowski & Eichelsdoerfer, 2009) and the relative affluence of the participants (86.7% were educated to degree level or above; Table 4). Finally, the perceptions that troubles with chewing MedDiet's components and pesticides residues on MeDiet's foods are factors which prevent from adhering to MedDiet have been found elsewhere (Dijkstra *et al.,* 2015), were not confirmed in our study. The discrepancies between these findings may be attributed to differences in nationality and personal characteristics. As far as, the rest of the factors related to adherence to MedDiet was not observed any statistical significance or even some tendency. Our small sample size can induce statistical errors and this is something that allows future investigation on the topic to be done.

Strengths and Limitations

This project had major strengths and some limitations as well. To the best of our knowledge, there is no similar study in the literature for comparing these findings. Our findings tally well with the results of the existing international research studies. Many similarities were found between the influences of various factors into the adoption of MedDiet. Like any study, this one has its limitations. Our sample was relatively small, although sufficient for statistical purposes and the initial sample target was achieved. Conducting a study only through social media (Facebook, twitter and BU research blog) affected our sample size, which could have been bigger. This means that there is a bias, as only people who had computers or access to social media could take part in this survey, which affect the generalization of our results. Additionally, data on questionnaire were self-reported, so our results could be subject to some recall bias and to the natural tendency to report without giving attention to detail. Thus it is possible that we have underestimated the true association between MEDAS scores and some of the factors that influence adoption of or adherence to MedDiet.

3.5 Conclusions

According to the present study, two factors related to adoption of MedDiet and none related to adherence to MedDiet were found to impact on the consumption of the Mediterranean dietary pattern in an adult population of British citizens. Different factors were important for the adoption and the adherence of MedDiet. Results related to MedDiet's adherence factors might show some tendencies which can be investigated further in a bigger study in the future. Although this is a small-scale study, contributes to the development of research in this field and the results may be used in similar contexts. If our findings are confirmed in future studies, nutrition professionals can consider the development of nutritional interventions based on the influencing factors, as one of the managerial approaches for promoting a Mediterranean style diet outside Mediterranean regions. We recommend that future studies use a larger sample size to confirm the findings of this study.

CHAPTER IV
Combined conclusions and future recommendations

4.1 Combined Conclusions

By conducting the two studies (SLR & pilot questionnaire study) we managed to combine findings from previous studies with our current project. The questionnaire study it was not possible to be done without having done previously a Systematic literature review, in order to find and create the themes that are relevant to adoption of and adherence to MedDiet. These themes generated the questions that were included in the pilot questionnaire study. The ultimate goal of this project was to synthesize British citizens' perceptions relevant to Mediterranean diet and how easy or difficult is for them to live in a non-Mediterranean region and try to adopt or adhere MedDiet.

The synthesis of people's perceptions around the world from the conduction of SLR highlighted the difficulty they have to adapt to a Mediterranean style diet outside of a Mediterranean region. This was corroborated from the total Mediterranean diet adherence score of the British citizens' who took part in the pilot online survey, which was found to be below moderate level. According to the present study, some factors related to adoption of MedDiet were found to impact on the consumption of the Mediterranean dietary pattern. Our synthesis of findings from various studies provided insight into the factors that could possibly influence adoption of and adherence to MedDiet in healthy adults globally. The influencing factors that were documented included: financial, sociocultural, hedonic, motivational, demographic, cognitive, factors related to access to facilities and resources and perceptions related to health and quality of life. Moreover, our findings indicated that two factors had statistical significant impact on Mediterranean diet adoption. We did not find any statistical significance in questions related to adherence of MedDiet. Even though, for some adherence related factors we documented participants' tendencies (either positive or negative), and this needs to be investigated in future studies with higher sample size in order to establish a more thorough understanding around the MedDiet adherence factors. The combination of the two studies allowed us to make a step closer to understand the way British citizens are thinking of MedDiet, we documented their tendencies, measured their adherence scores and highlighted the possible barriers and facilitators towards adoption of and adherence to MedDiet.

4.2 Future Recommendations

There are a number of gaps in our knowledge around influential factors in adoption of and adherence to MedDiet in British citizens, and would benefit from further research, including realist evaluation to extend and further test the results and insights we have documented here. The reported barriers and enablers to adoption of and adherence to MedDiet could be considered in future development of nutrition interventions to promote Mediterranean style diet outside Mediterranean regions and also inside England and United Kingdom. Even though this is a small-scale study, contributes to the development of future research in the field. Many factors either were not found to be correlated with Mediterranean diet adoption or adherence neither the correlation between them was weak or not statistical significant. Further investigation is needed in order to create a more thorough understanding around the influencing factors of adoption and adherence of the Mediterranean style diet outside Mediterranean regions.

Factors related to adoption of Mediterranean diet indicated that: (1) smoking habit prevents adoption and (2) family members and upbringing are helping adoption of MedDiet. The influence of family members and the upbringing on people's adoption of MedDiet, the creation of educational programmes inside England's primary and secondary schools, inside universities and other public educational actions could possibly influence in the increase of the MedDiet's adoption rates inside England's region. These actions need to be organized with government's help in cooperation with nutrition related organizations. Concerning lowering smoking levels around England, this could influence the increase of MedDiet's adoption rates. Interventions that can be effective in achieving this include increases in the price of tobacco products, mass media anti-smoking advertising, smoke-free policies, smoking curricula in schools, restrictions on marketing opportunities for the tobacco industry as well as social norms that lead to restrictions on adolescents' ability to purchase cigarettes. Comprehensive tobacco control programmes that aim to demodulate smoking behaviour in the community contain all of these interventions. Consistent and inescapable messages from multiple sources appear to be key to success. Given the weakness of some of the reported correlations and the small sample size, we recommend that future studies use a larger sample size to confirm the findings and the correlations of this study. Taken together, our findings suggest adherence to MedDiet to be explained by, and thus that strategies for increasing adoption and adherence of MedDiet should focus on: increasing awareness and improving

perceptions around MedDiet's overall health benefits; improving understanding of MedDiet disease prevention roles; minimizing complex and contradictory dietary information; increasing availability and range of MedDiet foods in the markets. If our findings are confirmed in future studies, nutrition professionals can consider the development of nutritional interventions based on the influencing factors, as one of the managerial approaches for promoting a Mediterranean style diet outside Mediterranean regions.

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Statement of independent work

I hereby confirm that this thesis was written independently by myself without the use of any sources beyond those cited, and all passages and ideas taken from other sources are cited accordingly.

APPENDICES

QUESTIONNAIRE SURVEY

Investigating factors that influence adoption of and adherence to Mediterranean style diet in healthy adults who live in England

Consent Form

Welcome to the Survey.

Full title of project: Investigating factors that influence adoption of and adherence to Mediterranean style diet in healthy adults who live in England

Participant Agreement Form

You should only agree to participate in the study if you agree with all the statements in this table and accept that participating will involve the listed activities.

I have read and understood the Participant Information Sheet and have been given access to the BU Research Participant Privacy Notice which sets out how we collect and use personal information (https://www1.bournemouth.ac.uk/about/governance/access-information/data-protection-privacy).

I understand that my participation is voluntary. I can stop participating in research activities at any time without giving a reason.

I understand that, if I withdraw from the study, I will also be able to withdraw my data from further use in the study except where my data has been anonymised (as I cannot be identified) or it will be harmful to the project to have my data removed.

I understand that my data may be included in an anonymised form within a dataset to be archived at BU's Online Research Data Repository.

I understand that my data may be used in an anonymised form by the research team to support other research projects in the future, including future publications, reports or presentations.

By Pressing **I agree** you consent to take part in the online survey and you are indicating that you fully understand the above information.

Participant Withdrawal: You can refuse the offer to participate in the survey and you can withdraw from it simply by closing down the on-line link at any time if you wish, without being required to provide an explanation.

Contact information

If you have any further questions about this study, please contact **Mr Dimitrios Vlachos** by email at <u>dvlachos@bournemouth.ac.uk</u>. Alternatively, you may wish to contact my supervisors: **Dr Fotini Tsofliou**, Principal Academic in Nutrition, <u>ftsofliou@bournemouth.ac.uk</u> and **Professor Katherine Appleton,** Professor In Psychology, <u>k.appleton@bournemouth.ac.uk</u>

1. Do you agree to participate? *Required*

○ YES   ○ NO

Consent form

Please **_tick YES_** to confirm that:

2. Please _tick "YES"_ to confirm that: _Required_

Please don't select more than 1 answer(s) per row.

Please select at least 1 answer(s).

	YES	NO
1) Your age is over 18 years old	☐	☐
2) You are free of food intolerance or food allergies (e.g. gluten intolerance, or any food allergy)	☐	☐
3) You do NOT have any chronic disease (e.g.: Hypertension, Cardiovascular disease, Diabetes, Renal or Liver disease, Cancer, etc…) that may affect your diet/appetite	☐	☐
4) You do NOT take any medication that affects your appetite	☐	☐
5) You are NOT following a specific diet due to illness	☐	☐
6) You are NOT from a Mediterranean country (Greece, Spain, Albania, Italy, Gibraltar, France, Monaco, Malta, Slovenia, Croatia, Bosnia & Herzegovina, Montenegro, Turkey, Cyprus, Lebanon, Israel, Syria, Palestine, Egypt, Libya, Tunisia, Algeria, Morocco)	☐	☐

3. Have you been able to answer _"YES"_ in ALL the above statements?

○ YES   ○ NO

Survey

SECTION 1: **What is a Mediterranean Diet?**

Essentially, following a Mediterranean Diet means eating in the way that the people in the Mediterranean region traditionally ate. The traditional Mediterranean Diet includes:

1. A generous portion of fresh fruits and vegetables
2. Unrefined wholegrains, breads and cereals
3. Legumes
4. Oily fish
5. Lots of olive oil
6. Nuts & seeds
7. Moderate consumption of dairy
8. Moderate intake of alcohol, usually in the form of red wine (with meals)
9. Low intake of meat (especially red & processed meat)
10. Low consumption confectionary, baked goods and soft drinks
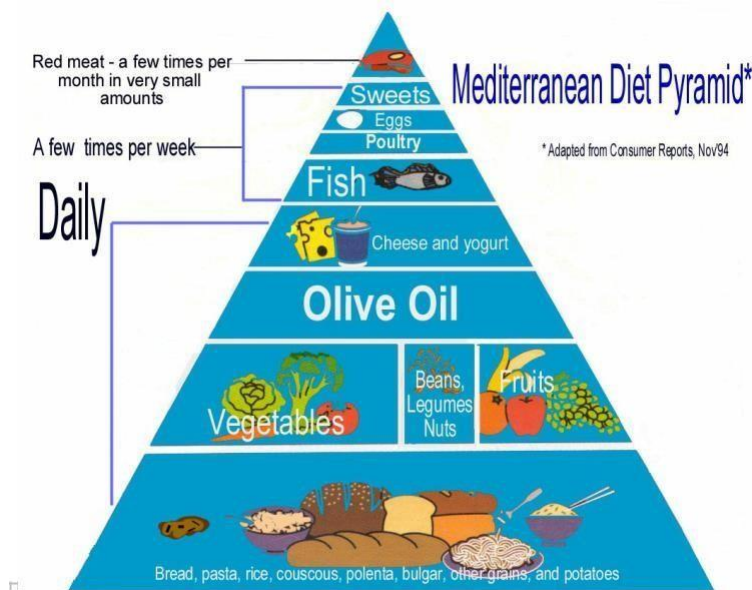
SECTION 2: **Mediterranean Diet Adherence Screener (MEDAS)**

For each of the questions below, tick (√) the response that best characterizes how you feel about the statement. Each question could be assigned only one response (√).

4. **Do you use olive oil as the principal source of fat for cooking?**   *Required*

○ YES   ○ NO

5. **How much olive oil do you consume per day (including that used in frying, meals eaten away from home, salads, etc.)?** *(1 tablespoon = 13.5g)* *Required*

○ less than 1 tablespoon

○ 1 to 3

○ 4 or more

6. **How many servings of vegetables do you consume per day? (1 serving = 200g - side dishes count as ½ a serving, not including potatoes or sweetcorn)** *Required*

○ less than 1

○ 1

○ 2 or more

7. **How many pieces of fruit (including fresh-squeezed fruit juice) do you consume per day?** *(not including frozen or dried fruit)* *Required*

○ less than 1

○ 1 to 2

○ 3 or more

8. **How many servings of red meat, hamburger, or meat products (ham, sausage, etc.) do you consume per day?** *(1 serving = 100-150g)* *Required*

○ less than 1

○ 1 to 2

○ 3 or more

9. **How many servings of butter, margarine, or cream do you consume per day?**
(1 serving = 12g, 1 tablespoon) *Required*

- ○ less than 1
- ○ 1 to 2
- ○ 3 or more

10. **How many sugar-sweetened beverages do you drink per day?** *(1 cup = 100 ml)*
Required

- ○ less than 1 cup
- ○ 1 to 2
- ○ 3 or more

11. **How much wine do you drink per week? (1 glass =125 ml)** *Required*

- ○ less than 1 glass
- ○ 1 to 3
- ○ 4 to 6
- ○ 7 or more

12. **How many servings of pulses (beans, peas, lentils etc.) do you consume per week?**
(1 serving = 150g) (including canned varieties) *Required*

- ○ less than 1
- ○ 1 to 2
- ○ 3 or more

13. **How many servings of fish or shellfish/seafood do you consume per week?** *(1 serving = 100-150 g fish, or 4-5 pieces or 200 g shellfish)* *Required*

- ○ less than 1
- ○ 1 to 2
- ○ 3 to 5
- ○ 6 or more

14. **How many times per week do you consume commercial sweets or pastries (not homemade), such as cakes, cookies, biscuits, or custard?** *Required*

- ○ less than 2
- ○ 2 to 5
- ○ 6 or more

15. **How many servings of nuts (including peanuts) do you consume per week?** *(1 serving = 30g)* *Required*

- ○ less than 1
- ○ 1 to 2
- ○ 3 to 5
- ○ 6 or more

16. **Do you prefer to eat chicken, turkey, or rabbit meat instead of beef, pork, hamburgers, or sausages?** *Required*

- ○ YES　　　　　○ NO

17. **How many times per week do you consume cooked vegetables, pasta, rice, or other**

dishes prepared with a sauce of tomato, garlic, onions or leeks sautéed in olive oil (sofrito)? *Required*

○ less than 1

○ 1

○ 2 or more

SECTION 3**: Barriers & Facilitators to follow a Mediterranean style diet** (MedDiet)

18. **Are you currently adhering to the Mediterranean style diet?** *Required*

○ YES

○ NO

Factors that related to adoption of Mediterranean style diet.

19. **Factors that related to adoption to Mediterranean style diet.** For each of the factors below, tick (√) the response that best characterizes how you feel about the statement. Each factor could be assigned only one response (√). *Required*

Please don't select more than 1 answer(s) per row.

Please select at least 31 answer(s).

	Strongly disagree	Moderately disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Moderately agree	Strongly agree
Adoption of MEdDiet is helping me to prevent diseases	☐	☐	☐	☐	☐	☐	☐
I find that awareness of the psychological health benefits of MEdDiet is helping me to adopt to the diet	☐	☐	☐	☐	☐	☐	☐
I find that awareness of the psychological health benefits of MEdDiet is preventing me from adopting to the diet	☐	☐	☐	☐	☐	☐	☐

I find that awareness of the physical health benefits of MEdDiet is helping me to adopt the diet	☐	☐	☐	☐	☐	☐	☐
I find that awareness of the physical health benefits of MEdDiet is preventing me from adopting to the diet	☐	☐	☐	☐	☐	☐	☐
I find that my sedentary lifestyle helps adoption to MedDiet	☐	☐	☐	☐	☐	☐	☐
I find that my sedentary lifestyle prevents adoption to MedDiet	☐	☐	☐	☐	☐	☐	☐
I find that my smoking habits prevents adoption to MedDiet	☐	☐	☐	☐	☐	☐	☐
find that my smoking habits helps adoption to MedDiet	☐	☐	☐	☐	☐	☐	☐

I find that my overall healthy lifestyle is helping me to adopt and adhere to MedDiet	☐	☐	☐	☐	☐	☐	☐
I find that my overall healthy lifestyle is preventing me from adopting and adhering to MedDiet	☐	☐	☐	☐	☐	☐	☐
I find that my family members & my upbringing is preventing me from adoption to MedDiet	☐	☐	☐	☐	☐	☐	☐
I find that my family members & my upbringing is helping me to adopt MedDiet	☐	☐	☐	☐	☐	☐	☐
I find that time consuming preparation and cooking of fresh food prevents my adoption of MedDiet	☐	☐	☐	☐	☐	☐	☐

I find that time consuming preparation and cooking of fresh food helps my adoption of MedDiet	☐	☐	☐	☐	☐	☐	☐
My adoption of MedDiet is being prevented from complex & contradictory dietary information from media	☐	☐	☐	☐	☐	☐	☐
My adoption of MedDiet is being helped from complex & contradictory dietary information from media	☐	☐	☐	☐	☐	☐	☐
I find difficult to adopt a Mediterranean style diet, due to the basic differences between British food culture and Mediterranean style diet	☐	☐	☐	☐	☐	☐	☐

I find it difficult to eat less red meat due to British food culture	☐	☐	☐	☐	☐	☐	☐
I am able to eat less red meat due to British food culture	☐	☐	☐	☐	☐	☐	☐
I feel that the term "diet" elicits ideas of restriction	☐	☐	☐	☐	☐	☐	☐
I find legumes such as lentils unappealing	☐	☐	☐	☐	☐	☐	☐
I find legumes such as lentils palatable	☐	☐	☐	☐	☐	☐	☐
Media's reports for dietary information are helpful to get familiar with MedDiet	☐	☐	☐	☐	☐	☐	☐
Media's reports for dietary information are preventing me from getting familiar with MedDiet	☐	☐	☐	☐	☐	☐	☐

Consuming cold Mediterranean food recipes when living in cold climate is easy for me	☐	☐	☐	☐	☐	☐	☐
I find it difficult to consume cold Mediterranean food recipes when living in cold climate	☐	☐	☐	☐	☐	☐	☐
I find that knowing how to cook fresh food helps my adoption & adherence to MedDiet	☐	☐	☐	☐	☐	☐	☐
I am able to adopt & adhere to MedDiet without knowing how to cook fresh food	☐	☐	☐	☐	☐	☐	☐
I find it difficult to give-up liked foods	☐	☐	☐	☐	☐	☐	☐
I am able to give-up liked foods	☐	☐	☐	☐	☐	☐	☐

SECTION 4: **Demographic and Lifestyle Characteristics**

20. Date of birth

Dates need to be in the format 'DD/MM/YYYY', for example 27/03/1980.

[   ] 🗓

(dd/mm/yyyy)

21. What best describes your gender? *Required*

- ○ Male
- ○ Female
- ○ Prefer not to say

22. What best describes your gross annual household income? *Required*

- ○ ≥£52 000
- ○ £33 800 to £52 000
- ○ £23 400 to £33 800
- ○ £13 000 to £23 400
- ○ <£13 000

23. What is your marital status? *Required*

- ○ Single
- ○ Married
- ○ Divorced
- ○ Separated/widowed
- ○ Living together with partner

24. **What is your educational level?** *Required*

○ University or College Degree

○ Higher education

○ A-level school examinations taken at 18 years

○ O-level or GCSE school examinations taken at 16 years

○ Certificate of secondary education (CSE) taken at 14-16 years at a lower level ○ No Qualifications

25. Smoking status *Required*

○ Ex-smoker

○ Never smoked

○ Current smoker

26. What is your current Body Weight in kilograms? (1 pound = 0.45 kilograms)
Required

27. **What is your Height in centimetres? (1 inch = 2.54 centimetres)** *Required*

28. **What is your Waist Circumference in centimetres? (1 inch = 2.54 centimetres)** *Optional*

[85]

29. **How long have you lived in England?** *Required*

   ○ Less than 1 year

   ○ 1-2 years

   ○ 3 or more years

30. **Ethnicity** *Required*

   ○ White

   ○ Hispanic or Latino

   ○ Black or African American

   ○ Native American or American Indian

   ○ Asian / Pacific Islander

   ○ Other

SECTION 5: **General questions**

31. **How long it took to complete the questionnaire?** *Optional*

○ ≥60 minutes
○ 30 to 60 minutes
○ 15 to 30 minutes
○ 5 to 15 minutes

32. **Did you find the questionnaire lengthy?** *Optional*

○ YES   ○ NO

33. **How did you find questionnaire's structure & the type of questions?** *Optional*

Your answer should be no more than 400 characters long.

[text input field]

Factors that related to adherence of Mediterranean style diet.

34. **Factors that related to adherence to Mediterranean style diet.** For each of the factors below, tick (√) the response that best characterizes how you feel about the statement. Each factor could be assigned only one response (√). *Required*

Please don't select more than 1 answer(s) per row.

Please select at least 18 answer(s).

	Strongly disagree	Moderately disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Moderately agree	Strongly agree
My adherence to MedDiet in UK is prevented from the increase of the overall food expenses of my household	☐	☐	☐	☐	☐	☐	☐
Adhering to Mediterranean diet is going to broaden my food repertoire	☐	☐	☐	☐	☐	☐	☐
The possibility of pesticides residues on MedDiet foods (e.g. fruits or vegetables) is obstructing my adherence to MedDiet	☐	☐	☐	☐	☐	☐	☐
My adherence to MedDiet is prevented from my irregular working hours (e.g. night shifts)	☐	☐	☐	☐	☐	☐	☐

My adherence to MedDiet is hindered from my lack of motivation to cook healthy meals	☐	☐	☐	☐	☐	☐	☐
Troubles with chewing some of Mediterranean diet's components (e.g.: fruits) is obstructing my adherence to the diet	☐	☐	☐	☐	☐	☐	☐
I find that being married or cohabiting helps adherence to MedDiet	☐	☐	☐	☐	☐	☐	☐
I find that being married or cohabiting prevents adherence to MedDiet	☐	☐	☐	☐	☐	☐	☐
Shared responsibility of food preparation is obstructing my adherence to MedDiet	☐	☐	☐	☐	☐	☐	☐
I find that lack of knowledge of the health benefits of MedDiet, prevents my adherence to the diet	☐	☐	☐	☐	☐	☐	☐

Lack of know how to incorporate the food components of the Mediterranean style diet into my meals	☐	☐	☐	☐	☐	☐	☐
I know how to incorporate the food components of the Mediterranean style diet into my meals	☐	☐	☐	☐	☐	☐	☐
I am able to buy the Mediterranean diet (MedDiet) foods in order to follow the diet	☐	☐	☐	☐	☐	☐	☐
I find the foods of the MedDiet unaffordable moneywise	☐	☐	☐	☐	☐	☐	☐
The range of MedDiet foods where I shop is good	☐	☐	☐	☐	☐	☐	☐
I find that quick spoilage of certain MedDiet foods (e.g. fruits and vegetables) makes me to avoid them	☐	☐	☐	☐	☐	☐	☐
I find it difficult to follow the MedDiet living on my own	☐	☐	☐	☐	☐	☐	☐

I find it difficult to find variety of foods from each food group/component of the MEdDiet where I shop (e.g. legumes, olive oil, fruits, vegetables, fish and other) is limited	☐	☐	☐	☐	☐	☐	☐

SECTION 4: **Demographic and Lifestyle Characteristics**

35. **Date of birth**

Dates need to be in the format 'DD/MM/YYYY', for example 27/03/1980.

[   ] 🗓

(dd/mm/yyyy)

36. **What best describes your gender?** *Required*

○ Male

○ Female

○ Prefer not to say

37. **What best describes your gross annual household income?** *Required*

○ ≥£52 000

○ £33 800 to £52 000

○ £23 400 to £33 800

○ £13 000 to £23 400

○ <£13 000

---

38. **What is your marital status?** *Required*

○ Single

○ Married

○ Divorced

○ Separated/widowed

○ Living together with partner

---

39. **What is your educational level?** *Required*

○ University or College Degree

○ Higher education

○ A-level school examinations taken at 18 years

○ O-level or GCSE school examinations taken at 16 years

○ Certificate of secondary education (CSE) taken at 14-16 years at a lower level ○ No Qualifications

---

40. Smoking status *Required*

○ Ex-smoker

○ Never smoked

○ Current smoker

---

41. **What is your current Body Weight in kilograms? (1 pound = 0.45 kilograms)** *Required*

[Text input field]

42. **What is your Height in centimetres? (1 inch = 2.54 centimetres)** *Required*

[Text input field]

43. **What is your Waist Circumference in centimetres? (1 inch = 2.54 centimetres)** *Optional*

[Text input field]

44. **How long have you lived in England?** *Required*

○ Less than 1 year
○ 1-2 years
○ 3 or more years

45. **Ethnicity** *Required*

○ White
○ Hispanic or Latino
○ Black or African American
○ Native American or American Indian
○ Asian / Pacific Islander
○ Other

SECTION 5: **General questions**

46. **How long it took to complete the questionnaire?** *Optional*

○ ≥60 minutes
○ 30 to 60 minutes
○ 15 to 30 minutes
○ 5 to 15 minutes

47. **Did you find the questionnaire lengthy?** *Optional*

○ YES   ○ NO

48. **How did you find questionnaire's structure & the type of questions?** *Optional*

Your answer should be no more than 400 characters long.

[   ]

Thank you, but you are not eligible to take part on the survey.

Final page

Thank you for completing our online survey.

Questionnaire Flyer

# *Following a Mediterranean style diet in England*

New online survey is looking for volunteers to find out: "what are the factors that might influence adoption and adherence to a Mediterranean style diet in UK?"

WHO:
- ✓ **Healthy adults who live in England, aged over 18 years old**
- ✓ **Not of Mediterranean origin** (Greece, Spain, Albania, Italy, Gibraltar, France, Monaco, Malta, Slovenia, Croatia, Bosnia & Herzegovina, Montenegro, Turkey, Cyprus, Lebanon, Israel, Syria, Palestine,
                    Egypt, Libya, Tunisia, Algeria, Morocco)
- ✓ **Not suffering from any: food intolerance, food allergies or any chronic disease that might affect food consumption or appetite**

Interested to take part?
Scan the QR code with your phone camera or enter the link below on your browser
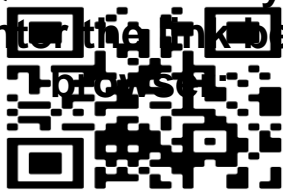
SCAN ME

Come join us anonymously

https://bournemouth.onlinesurveys.ac.uk/dimitris

For more information about the research please contact: dvlachos@bournemouth.ac.uk

This is a PGR project and is approved by the Bournemouth University Ethics Committee [98