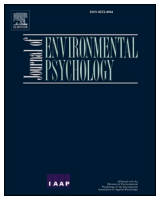
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A quantitative assessment of barriers to adopting the sustainable Mediterranean diet

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ABSTRACT

High-meat consumption negatively impacts our planet and our health, especially in high-income countries where this eating pattern is the norm. The plant-rich Mediterranean diet reduces these adverse environmental and human health effects, and omnivore eaters are more likely to adopt it than a meat-exclusionary diet. Knowing the barriers to Mediterranean diet adoption is critical to designing effective interventions to promote behaviour change. Therefore, using the capability-opportunity-motivation (COM-B) behaviour change model as an organising framework, this study identified key barriers that predicted the likelihood of Mediterranean diet adoption in an Australian sample ($N = 443$). In terms of existing diet, omnivores in the sample, on average, consumed meat more often than their meat-reducing counterparts, while also consuming legumes less often and reporting less familiarity with the Mediterranean diet. In terms of barriers to adopting the Mediterranean diet in the future, exploratory factor analysis revealed four main factors covering all three components of the COM-B model: *Meat Dependence, Lack of Time and Knowledge, Household Dietary Preferences,* and *Food Allergies and Clean Eating.* Hierarchical regression analysis revealed that *Mediterranean Diet Familiarity,* the four factors from the factor analysis, and an additional standalone question, *Not Having to Cook for Others,* together explained 44% of the variability in adopting the Mediterranean diet. *Mediterranean Diet Familiarity* accounted for 21.2% of the unique variance in step one. These findings signify key components (e.g., diet familiarity and convenience) to consider when designing interventions focused on shifting people to a Mediterranean diet in a high-income, high-meat consuming country such as Australia.

1. Introduction

Global food systems are responsible for 25-42% of greenhouse gas emissions (GHGs; Crippa et al., 2021), with livestock production accounting for a substantial 16-37% of total emissions (Twine, 2021). Eating a plant-rich diet is now considered a vital strategy to reduce these GHGs and the associated environmental destruction caused by animal agriculture (Intergovernmental Panel on Climate Change [IPCC], 2022). Despite the urgent need to increase plant-rich diet consumption, meat demand continues to rise in response to increased urbanisation and personal incomes, specifically in developing countries, and due to increasing global population (Alexandratos & Bruinsma, 2012; Food and Agriculture Organization of the United Nations [FAO], 2017; Organisation for Economic Co-operation and Development [OECD]/-FAO, 2019). The high-meat 'Western' diet is becoming the global diet and some high-income countries, such as Australia, continue to consume more meat (~100 kg per capita per year) (Whitton et al., 2021) than is recommended by experts (Hendrie et al., 2022). While meat consumption eventually declines at very high-income levels, with corresponding increases in plant protein, the income threshold for this shift is too high on a global scale (Frontuto et al., 2025). The pace of change is therefore insufficient to address emissions from animal agriculture without targeted meat reduction interventions.

High levels of meat consumption have broader impacts beyond higher emissions, degradation of lands and water, and reduced biodiversity. Meat-heavy diets compromise human health and are linked to increased risk of cardiovascular diseases, some cancers, and type 2 diabetes (Demeyer et al., 2016; Li et al., 2018; Micha et al., 2010; Pan et al., 2011). Greater demand for meat also leads to more intensive farming practices that increase the scale of animal suffering (Bessei,

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2006; Dawkins et al., 2004; Gregory & Grandin, 2007; Harrison, 1964; Park et al., 2020; Peden et al., 2018; Thompson, 2015). Eating a plant-rich diet can alleviate these impacts, particularly in high-income countries where high-meat diets are entrenched (Aleksandrowicz et al., 2016; Batlle-Bayer et al., 2020; Springmann et al., 2018).

Encouraging omnivore eaters to eat a plant-rich diet is difficult (Stoll-Kleemann & Schmidt, 2017), especially in high-income countries where meat is usually central to a meal (Beardsworth & Bryman, 2004). Hence, meat-reduced plant-rich diets (e.g., Mediterranean and flexitarian/semi-vegetarian) are more appealing to high-meat eaters than meat exclusionary diets (e.g., vegetarian and vegan; Allenden et al., 2022). Even though vegetarian and vegan diets are generally better for the environment, human health, and animal welfare (Aleksandrowicz et al., 2016; Batlle-Bayer et al., 2020; Scherer et al., 2019), people are reluctant to adopt them at the level required to significantly impact the many negative effects of animal agriculture (Allenden et al., 2022). Therefore, meat-reduced diets could offer a more realistic and potentially faster way to reduce meat demand in high-meat-eating countries.

The Mediterranean diet is a meat-reduced diet that has high potential for uptake. It generally consists of high amounts of plants (vegetables and legumes), moderate levels of meat (chicken, fish, and other seafoods) and dairy, and low quantities of red meat (Bach-Faig et al., 2011). Broader adoption of the Mediterranean diet offers benefits to the individual and beyond. The Mediterranean diet has consistently been linked to fewer health risks (i.e., heart disease, type 2 diabetes, some cancers, and dementia) (Demeyer et al., 2016; Li et al., 2018; Micha et al., 2010; Pan et al., 2011; Shannon et al., 2023) and is significantly better for animal welfare and the environment than the omnivore diet (Aleksandrowicz et al., 2016; Allenden et al., 2022; Batlle-Bayer et al., 2020). In terms of environmental benefits, a recent study found that by substituting red meat (higher carbon food) with white meat (lower carbon food), per the Mediterranean diet, the United States could reduce their total dietary carbon footprint by more than 35% (Grummon et al., 2023). As such, promoting the Mediterranean diet in a high-income country such as Australia could reap substantial environmental benefits. Moreover, such a campaign could be favourably received because, out of five plant-rich diet options, an Australian population sample selected the Mediterranean diet as the most likely diet that they would adopt (Allenden et al., 2022). Given adoption of the Mediterranean diet remains low, identifying key barriers is crucial to the development of successful interventions.

To date, research on factors hindering Mediterranean diet adoption in non-Mediterranean countries has been predominantly observational and qualitative (Tsofliou et al., 2022). Common barriers were perceived lack of knowledge about the Mediterranean diet (including specific foods), affordability, lack of time to change diets, limited knowledge of Mediterranean diet recipes and how to use legumes in meals, a dislike of Mediterranean diet foods (e.g., fish, nuts, legumes), difficulties changing current eating habits to align with the Mediterranean diet (e.g., reducing red meat), and lack of family support (Tsofliou et al., 2022). Living in a non-Mediterranean country was also a barrier due to cold climate impacts, the seasonal availability of Mediterranean diet foods, and distinct cultural food norms (Moore et al., 2018; Scannell et al., 2020).

While this qualitative research is informative, quantitative research is needed to determine whether these barriers significantly predict Mediterranean diet adoption and, if so, the relative magnitudes of their effects. Recent quantitative research in Mediterranean countries, where diet adherence is also declining, found that health (allergenic foods), picky eating, affordability, and inconvenience all predict low adherence (Biggi et al., 2024). Conversely, identifying as someone interested in sustainable diet eating strengthened ones' intention and adherence to the Mediterranean diet (Biasini et al., 2023). Similar quantitative research in non-Mediterranean countries would clarify the impact of these barriers on broad-scale adoption, enabling more targeted, evidence-based interventions.

Changing dietary behaviours, however, is difficult due to their habitual nature (Rees et al., 2018; Stoll-Kleemann & Schmidt, 2017). Behaviour change models comprehensively assess behaviours and are considered best practice when designing behaviour change interventions (Michie et al., 2011), but few studies promoting change to the Mediterranean diet have used them (Tsofliou et al., 2022). Michie et al.'s (2011) Behaviour Change Wheel (BCW; Fig. 1) is a framework that incorporates both internal and external factors by assessing a person's capability, opportunity, and motivation (COM-B) to perform a target behaviour. These three interacting components form the inner layer of the BCW:

- Capability is an individuals' psychological and/or physical capacity to engage in the behaviour. Psychological capability includes the knowledge and mental processes to perform the behaviour, whereas physical capability refers to the physical skills or stamina required (Michie et al., 2011). With the Mediterranean diet, capability may include diet awareness and knowledge (e.g., meat portion sizes, Mediterranean diet foods and recipes), and the mental capacity and perceived affordability to change diets (Tsofliou et al., 2022).
- Opportunity refers to external physical and/or social factors that make a behaviour possible or prompt it to occur (Michie et al., 2011). For example, a person's opportunity to adopt the Mediterranean diet can be influenced by time available to prepare meals, other household members' dietary preferences, and cultural food norms (Tsofliou et al., 2022).
- Motivation is defined as brain processes that direct behaviour. It can be reflective (e.g., intentions, beliefs, and perceived behavioural control) or automatic (e.g., habitual processes, emotions, and impulses; Michie et al., 2011). A person's motivation to eat the Mediterranean diet may be impacted by their pro-environmental worldviews, health concerns, general attitudes towards eating meat, current dietary habits, and taste preferences (Tsofliou et al., 2022).

The BCW framework was initially developed in the health psychology field (Michie et al., 2011) and later extended to the pro-environmental sector (Allison et al., 2021; Sundaraja et al., 2021), including meat-reduction (van den Berg et al., 2022). The COM-B was also used to qualitatively assess and design a peer-support intervention to increase Mediterranean diet adoption for patients at high cardiovascular risk (McEvoy et al., 2018). Adding to this research, the authors used this model to qualitatively assess barriers and drivers to Mediterranean diet adoption in an Australian community sample ($N = 16$) (Allenden et al., 2024). Themes identified in this research were organised according to the COM-B model (see Fig. 2). Specifically, changing ingrained meat-eating habits, a lack of physical and mental availability to change diets, and household influences (i.e., cooking for others, including children, who do not want to change their high-meat consumption) were key barriers to adoption.

The current study aims to extend this research with a quantitative assessment of the barriers to Mediterranean diet adoption in Australian meat eaters. The authors developed a Mediterranean diet barriers measure, using the COM-B model as an organising framework to ensure comprehensive coverage of barriers across capability, opportunity, and motivation. Previous meat-reduction research informed measure development (Abrahamse et al., 2009; Allenden et al., 2024; Graça et al., 2015; Grisolía et al., 2015; Hodson & Earle, 2018; Lea et al., 2006; Lea & Worsley, 2001; Malek et al., 2019; Mullee et al., 2017; Papadaki et al., 2016; Piazza et al., 2015; Scannell et al., 2020; Schösler et al., 2015; Steptoe et al., 1995; Tsofliou et al., 2022) with items categorised according to COM-B components during survey development (see supplementary data_A).

Based on past research examining barriers to dietary change presented above, we propose the following hypotheses:

H1. (Diet group consumption differences): Participants who self-identify as omnivore eaters will report eating meat (particularly red

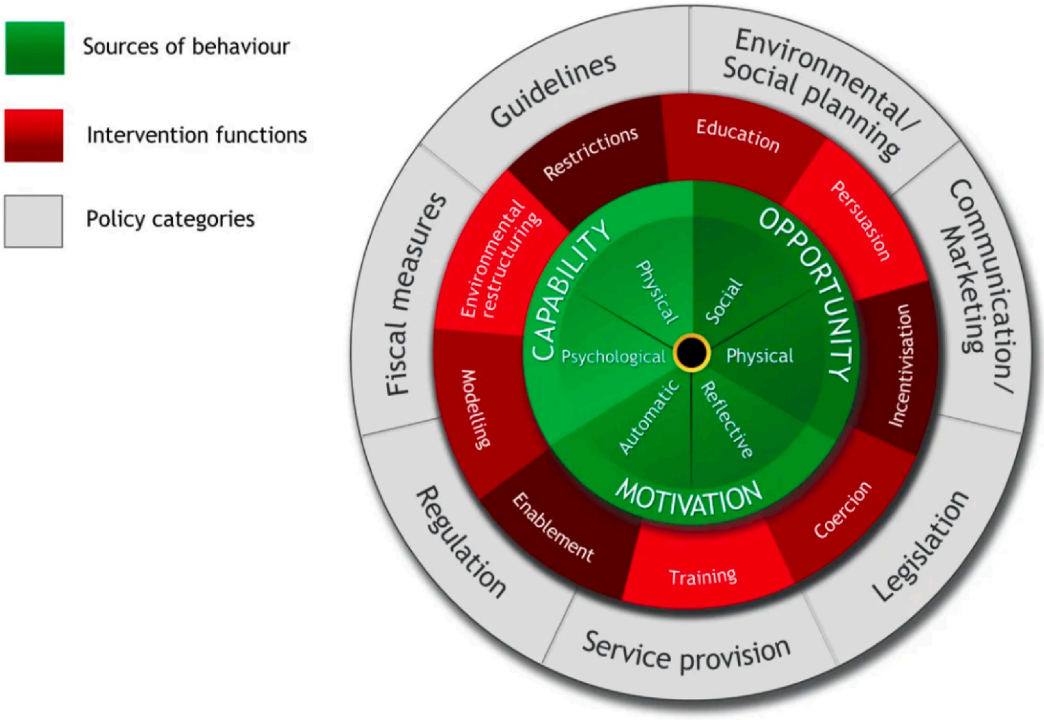


Fig. 1. The Behaviour Change Wheel. Reprinted from "The behaviour change wheel: A new method for characterising and designing behaviour change interventions," by S. Michie, M. *M. van* Stralen and R. West, 2011, Implementation Science, 6(42), p. 7. Copyright [2011] by Michie et al., licensee BioMed Central Ltd. Used under Creative Commons Attribution License: http://creativecommons.org/licenses/by/2.0. (In colour). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

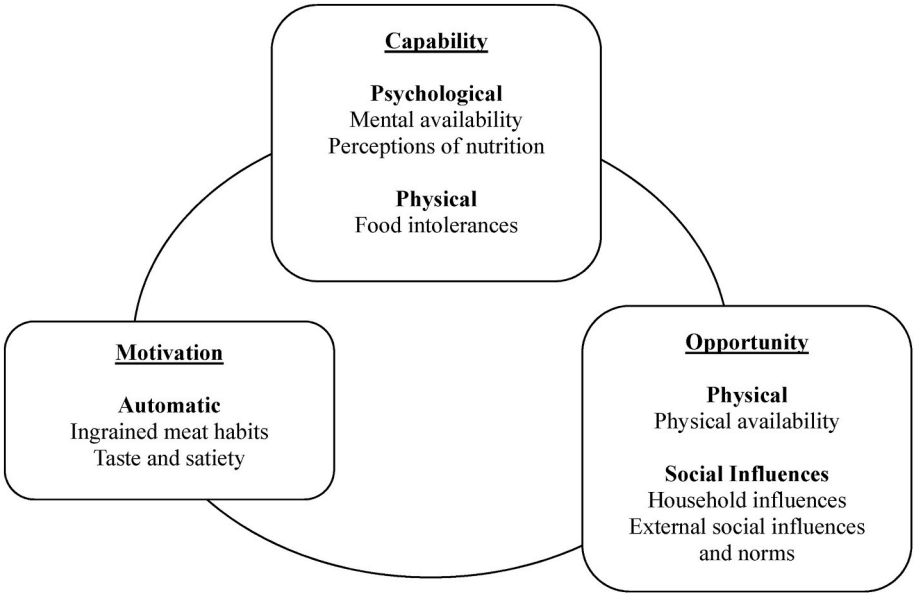


Fig. 2. A summary of results for themes organised according to the COM-B model.

meat) more frequently and meat-replacement foods (particularly legumes) less frequently than those who identify as eating a meat-reduced diet.

H2. (Diet group familiarity differences): Participants who self-identify as omnivore eaters will report lower familiarity with the Mediterranean diet than people who identify as eating a meat-reduced diet.

H3. (Barriers to Mediterranean diet): Identified barriers will negatively predict participants' reported likelihood of adopting the Mediterranean diet.

2. Methods

2.1. Participants and recruitment

Adults from the general population in Australia were recruited via Qualtrics™, an online database and survey administrator. After excluding meat avoiders (n = 21), 443 meat-eating respondents were

included in the analysis. A target sample size was determined by a power analysis. A similar COM-B study that assessed drivers of plant-rich diet adoption found medium effect sizes (Graça et al., 2019). Based on this research, the current study predicted a medium effect size of $f^2 = .15$ for testing the third hypothesis. Assuming a target power of .95, four to six predictive barrier factors, and an α level of .01, a power analysis using G*Power (Faul et al., 2009) suggested a minimum sample size of 169-189 participants.

All participants provided informed consent prior to commencing the survey. Participants who were younger than 18 years old and/or not the main or joint cook in the household were screened out of the survey. The 'main/joint cook' criterion ensured participants had control over the cooking process, given 'someone else cooking for me' is a recognised barrier in the meat reduction literature (Lacroix & Gifford, 2019; Mullee et al., 2017). A soft launch was conducted with 47 participants, and the median completion time was calculated. Participants who completed the survey in less than half the median time (4.18 min) were screened out for data quality. Two questions were included in the survey as attention checks, with Qualtrics™ screening out participants who failed either question. All survey questions required a response, though participants could select 'I prefer not to say' for gender, income, employment, and ethnicity.

Gender was subjected to quota sampling for representation (224 men, 218 women, and 1 non-binary/third gender), and to overcome possible bias from the main/joint cook criterion above, since men contribute to a significant portion of cooking duties (though less than women) in Australia (ABS, 2021). The median age of participants was 56 years, which is slightly higher than the national representative adult census data (ABS, 2021). Most participants had attained tertiary or trade education levels and were employed (33.0% full time, 14.7% less than 30 h per week, and 1.4% self-employed). Consistent with the older median age reported above, fewer participants were currently employed compared with the national representative census data (ABS, 2021). Most participants identified as Australian, with 56.9% reporting an annual household income of less than 75,000AUD (the median Australian household income for 2019 to 2020 was approximately 52, 338AUD) (ABS, 2021). Almost a quarter (23.9%) of participants lived in a single household, with couples (28.9%) the most common multi-household type. Household types generally aligned with those in the Australian population (ABS, 2021). See Table 1.

2.2. Measures

The online survey included items to assess a participant's socio-demographic characteristics, current meat and meat-replacement food consumption frequency, diet group, Mediterranean diet awareness, and barriers to Mediterranean diet adoption.

Table 1
Select characteristics of participants in sample and Australian Population.

		Sample	Population
Sex	Male	50.6	49.3
	Female	49.2	50.7
	Non-binary	0.2	**
Age	Median adult (yrs)	56	45-49
Education*	Post high school (trade, tertiary)	71.0	52.0
Employment*	Employed	49.1	58.0
Ethnicity*	Australian	72.7	66.9
	European	16.5	8.3
Household income	Median range/amount (AUD)	50-74,999	52,338
Household type*	Single person	23.9	25.6
	Couple with no children	28.9	26.6
	Couple with dependent children	16.3	8.2
	Couple with adult children	13.5	16.2

Note: Population data taken from Australian census (ABS, 2021). *Multiple responses provided, **Non-binary sex not included in census report.

2.2.1. Socio-demographic characteristics

Six items assessed participants' gender, age, ethnicity, education, employment status, household type, and annual household income (see supplementary data_B).

2.2.2. Current food consumption

To evaluate current eating habits as potential automatic motivation barriers, a single item assessed how often participants had eaten meat (red, poultry, and fish/seafood), and common Mediterranean diet (legumes) and non-Mediterranean diet (tofu, plant-based meat alternatives [PBMAs]) meat-replacement foods. Australia is a multi-ethnic (George et al., 2018) and non-Mediterranean diet country (Scannell et al., 2020). Therefore, tofu and PBMAs were included to assess cultural and food environment influences (ABS, 2022), respectively. The authors focused on these food items (excluding other Mediterranean diet foods, such as vegetables and grains) given the emphasis on meat reduction as the primary dietary shift required for Australians to adopt a Mediterranean diet. Participants indicated their consumption frequencies on a 5-point scale ('never,' '1 day per week,' '2 to 4 days per week,' 'most days [5 to 6 days per week],' and 'every day; ' as per Malek et al., 2019). A specific timeframe (i.e., last week) and item placement (i.e., preceding the group self-identity item) were used to reduce recall and social desirability selection bias, respectively (Althubaiti, 2016).

2.2.3. Self-identified diet groups

A single item assessed which diet most closely described what participants had eaten over the last week (Malek et al., 2019; Tsofliou et al., 2022). Options included six diets: omnivore, Mediterranean, flexitarian/semi-vegetarian, pescatarian, vegetarian, or vegan. A description of each diet was also provided to aid selection (see supplementary data_B). As highlighted above, those who identified as pescatarian, vegetarian, or vegan diet eaters were screened out. A second item assessed whether participants' other household members ate the same diet to evaluate household influences as a possible social opportunity barrier. If the response was 'no,' they indicated which diet most closely described what other household members had eaten.

2.2.4. Mediterranean diet awareness

Two items assessed Mediterranean diet awareness (i.e., psychological capability), as the current study was conducted in a non-Mediterranean diet country (Tsofliou et al., 2022). Participants indicated how familiar they were with the Mediterranean diet on a 5-point scale (1 = 'not at all familiar' to 5 = 'extremely familiar'). Participants then selected which statements (i.e., all that applied) they perceived described the Mediterranean diet (e.g., 'it is healthy,' 'it is expensive,' 'it includes a lot of red meat'). Statements included five accurate and six inaccurate options (based on the Mediterranean diet definition (Bach-Faig et al., 2011) and common perceptions from the Mediterranean diet research (Allenden et al., 2024; Moore et al., 2018; Tsofliou et al., 2022). to assess participant knowledge of the diet, with 'other' also provided as an option to gather additional information (see supplementary data_B).

2.2.5. Mediterranean diet information

To aid responses to the likelihood of adoption and COM-B measure questions, participants received information about the Mediterranean diet. This information included a figure displaying the Mediterranean diet pyramid (Medical News Today, n.d.), a plate example (Durrer Schutz et al., 2019), and written (Bach-Faig et al., 2011; Goldstein et al., 2016) and graphical comparisons between the Mediterranean and omnivore diets.

2.2.6. Likelihood of adopting the Mediterranean diet

In a single item, participants indicated how likely they were to adopt the Mediterranean diet in the next month on a 5-point scale (1 = 'extremely unlikely,' 5 = 'extremely likely').

2.2.7. Mediterranean diet barriers

The authors developed a measure to assess a range of potential barriers to Mediterranean diet adoption. The COM-B model provided an organising framework during development to ensure comprehensive coverage of barriers across capability, opportunity, and motivation components. The 74 items were informed by the qualitative study conducted by the authors (see above), and barriers identified in the Mediterranean diet and meat reduction literatures (Lacroix et al., 2019; Malek et al., 2019; Stoll-Kleemann & Schmidt, 2017). Some items (e.g., *'I always like to eat the same food;*' Lacroix et al., 2019) were taken directly from the literature while others *('I would have to go food shopping more often if I made a Mediterranean meal;*' Lea et al., 2006) were adapted to the Mediterranean diet, and others were developed by the authors (e.g., *'If I only had to cook for myself, I would easily eat a Mediterranean diet'*). Specific items about meat and meat-free meals were included because meat reduction is a key feature of the Mediterranean diet (Bach-Faig et al., 2011; Goldstein et al., 2016). This measure included items related to: (1) *capability* (e.g., knowledge, in relation to meat-free and Mediterranean diet recipes, Mediterranean diet food items [including meat] and health, and meat and the environment, affordability, and food allergies), (2) *opportunity* (e.g., household influences, external social influences, and physical availability to change diets), and (3) *motivation* (e.g., eating habits, taste preferences, and meat dependence/attachment). All items were randomised and rated on a 5-point scale (1 = 'not at all like me,' to 5 = 'just like me').

2.3. Statistical analysis

Descriptive statistics were calculated for sociodemographic, food consumption, self-identified diet group, and Mediterranean diet awareness and familiarity variables. Diet group comparisons were conducted using MANOVA and ANOVA analyses. The Mediterranean diet barrier measure was subjected to exploratory factor analysis (EFA), using the maximum likelihood extraction method, to determine the underlying structure of the measure and to reduce the data into more manageable units. Hierarchical multiple regression was then conducted to determine which variables (i.e., Mediterranean diet familiarity and factors from the EFA) best predicted likelihood of Mediterranean diet adoption. All statistical analyses were conducted using Jamovi, version 2.3.21 and IBM SPSS Statistics 28 (IBM corp., Armonk, NY, USA).

2.4. Ethics

The Human Research Ethics Committee of the University of New England provided ethics approval (Approval No. HE22-180).

3. Results

3.1. Descriptive overview

Most participants identified as omnivore eaters (71.8%), with fewer selecting the Mediterranean diet (16%) or the flexitarian/semi-vegetarian diet (12.2%) as best describing what they had eaten in the last week. Most households (78.8%) ate the same diet. Participants reported consuming poultry ($M = 1.77$, $SD = 0.67$) and red meat ($M = 1.7$, $SD = 0.79$) between 1 and 4 times a week. Fish ($M = 1.1$, $SD = 0.76$) and legumes ($M = 1.02$, $SD = 1.03$), on average, were consumed just over once a week, and tofu ($M = 0.31$, $SD = 0.75$) and PBMAs ($M = 0.26$, $SD = 0.7$) were consumed less than once per week. See Table 2.

Participants indicated low to moderate familiarity with the Mediterranean diet ($M = 2.48$, $SD = 1.28$), with 77.7% of participants either 'not at all familiar,' 'slightly familiar,' or 'somewhat familiar.' Participants' likelihood of adopting the Mediterranean diet was moderate ($M = 3.02$, $SD = 1.23$), with 39.7% of participants selecting 'extremely likely' and 'likely,' and 25.7% selecting 'neutral.'

Most participants thought the Mediterranean diet was healthy (62.1%), with less than 1% reporting it as unhealthy. Over half (58.2%) of participants believed that the Mediterranean diet included lots of nuts and olive oil, whereas less than half of the participants thought the Mediterranean diet included lots of fish and seafood (49.7%), had limited red meat (40.9%), and had small meat portions (39.1%). Conversely, few people thought it was expensive (8.4%), included a lot of red meat (5.4%), or was not good for the environment (2.9%).

3.2. Hypothesis testing

3.2.1. Hypothesis 1: Diet group differences in food consumption

To test the hypothesis that omnivores eat meat (particularly red meat) more often and meat replacements (particularly legumes) less often than flexitarian/semi-vegetarian and Mediterranean diet eaters, a multivariate analysis of variance (MANOVA) explored current food consumption across the three diets. Using Pillai's trace, a statistically significant variance was found between the three self-identified diet groups for the six food consumption frequency variables taken together ($V = .127$, $F(12, 872) = 4.928$, $p < .001$, $n^2 = .064$). For post-hoc analyses, an alpha level of .05 was adopted for consumption frequency variables with equal variance (red meat, fish, and legumes), whereas a conservative alpha level of .001 was applied for three variables (poultry, tofu, and PBMAs) where homogeneity of variance was violated. Overall, significant differences were found for the consumption frequencies of red meat, fish, and legumes across the three self-identified diet groups. Planned contrasts (using Dunnett, 1-tailed with omnivores as the contrast group) revealed that omnivores ate red meat significantly more often ($p < .001$) than Mediterranean diet (95% CI upper bound = −0.15) and flexitarian/semi-vegetarian eaters (95% CI upper bound = −0.34); and legumes significantly less often ($p < .05$) than Mediterranean diet

Table 2
Multivariate analysis of variance (MANOVA) of average consumption frequency of meat and meat-replacement foods for total sample and per diet group.

Meat and meat-replacement foods	Mean and Standard Deviation Scores (*M, SD*)				*F (2, 440)*	*p*-value	n^2
	Total sample ($N = 443$)	Omnivore ($n = 318$)	Mediterranean diet ($n = 71$)	Flexitarian/semi-vegetarian ($n = 54$)			
Red meat	1.7 (0.8)	1.8 (0.8)[a]	1.5 (0.8)[b]	1.3 (0.7)[b]	15.8	<.001[1]	.067
Poultry	1.8 (0.7)	1.8 (0.6)	1.7 (0.8)	1.7 (0.8)	1.74	.177[2]	.008
Fish	1.1 (0.8)	1.0 (0.8)	1.3 (0.6)	1.2 (0.8)	3.26	.039[1]	.015
Legumes	1.0 (1.0)	0.9 (1.0)[a]	1.2 (1.0)[b]	1.3 (1.0)[b]	4.68	.010[1]	.021
Tofu	0.3 (0.7)	0.3 (0.7)	0.3 (0.9)	0.5 (0.8)	3.33	.037[2]	.015
PBMA	0.3 (0.7)	0.2 (0.7)	0.3 (0.6)	0.5 (0.9)	5.29	.005[2]	.023

Note: Six food categories scored 0 = 4: 0 = Never, 1 = 1 day/wk, 2 = 2-4 days/wk, 3 = 5-6 days/wk, 4 = every day.
Values with different superscripts in rows differ significantly at $p < .05$, one-tailed, with omnivores as the contrast group.
[1] Significance assessed at $p < .05$.
[2] Significance assessed at $p < .001$ due to violation of homogeneity of variance.

(95% CI lower bound = 0.05) and flexitarian/semi-vegetarian eaters (95% CI lower bound = 0.06). No significant differences in how often participants ate fish were identified between omnivores and the meat-reduced groups. Overall, Hypothesis 1 is generally supported.

3.2.2. Hypothesis 2: Diet group differences in Mediterranean diet familiarity

An analysis of variance (ANOVA) was used to test the hypothesis that omnivore eaters would report lower familiarity with the Mediterranean diet than those eating a meat-reduced diet. This revealed that participants' familiarity with the Mediterranean diet differed significantly across the diet groups $F(2, 440) = 22.3$, $p < .001$) with a medium effect size ($n^2 = .092$). Tukey's post-hoc tests showed that Mediterranean diet (95% CI [−1.35, −0.59], $p < .001$) and flexitarian/semi-vegetarian (95% CI [−1.11, −0.26], $p < .001$) eaters were significantly more familiar with the Mediterranean diet than omnivore eaters. Hypothesis 2 is supported.

3.2.3. Hypothesis 3: Barriers to Mediterranean diet adoption

We performed exploratory factor analysis (EFA) of participants' responses to the Mediterranean diet barriers measure to identify distinct barrier factors for testing hypothesis three. The 74-item measure (with all questions phrased as barriers) was subjected to EFA. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.95, and Bartlett's test of sphericity was significant ($p < .001$), indicating the data were suitable for factor analysis. Using maximum likelihood extraction with oblimin rotation, factor retention decisions were guided by a combination of criteria including, scree plot inspection (Cattell, 1966), parallel analysis (Horn, 1965; O'Connor, 2000), eigenvalues, conceptual interpretability, and parsimony, consistent with best practise recommendations (Costello & Osborne, 2005; Zwick & Velicer, 1986). The scree plot indicated a clear elbow at four factors. The first four factors had eigenvalues of 23.44, 5.76, 2.83, and 2.02, with substantial decreases between successive factors, whereas the decrease between factors four and five was negligible (0.07), suggesting diminishing returns beyond four factors. Parallel analysis suggested a seven-factor solution, though different retention methods can reveal divergent results depending on data characteristics. Examination of five-, six-, and seven-factor solutions revealed conceptual overlap (e.g., household influences splitting into multiple similar factors), increased cross-loadings, and factors with few defining items, reducing interpretability. In contrast, the four-factor solution provided a parsimonious and theoretically meaningful structure suitable for subsequent analysis, accounting for 42.2% of the total variance, with high internal reliability (Cronbach's alphas .71 to .95).

Factors were defined using items with loadings greater than .45 and cross loadings of .35 or less. The four factors were labelled (1) *Lack of Time and Knowledge, (2) Meat Dependence, (3) Food Allergies and Clean Eating,* and *(4) Household Influences*. Composite scores for each factor were computed by averaging the items loading onto that factor and then used in subsequent analyses. Descriptive statistics, internal reliability, and item loadings are presented in Table 3.

To test the hypothesis that the identified factors would negatively predict participants' reported likelihood of adopting the Mediterranean diet, a three-step hierarchical multiple regression was conducted. In addition to the four barrier factors, *Mediterranean Diet Familiarity* was added to the model (as an individual item) in the first step being a key adoption barrier in non-Mediterranean countries (Tsofliou et al., 2022). This item was measured before the COM-B survey questions and Mediterranean diet presentation to obtain a more accurate assessment and was therefore excluded from the EFA. The second step included the four barrier factors identified in the EFA. The third step included one individual item that did not load onto any barrier factors, *'If I only had to cook for myself, I would easily eat a Mediterranean diet'* (renamed as '*Not Having to Cook for Others'*). This item was included in the model as it was identified as a key barrier in the authors' qualitative study and was moderately positively correlated with likelihood of Mediterranean diet

Table 3
Exploratory factor analysis descriptive statistics, internal reliability and pattern matrix loadings ($N = 443$).

Mediterranean diet barrier items	COM-B component	*M (SD)*	Factor loadings			
			1	2	3	4
Factor 1: Lack of Time and Knowledge (Opportunity, Capability; α = .94)						
I lack the cooking skills to prepare meat-free meals	Physical Capability	1.87 (1.25)	.76			
I never try out new recipes	Physical Capability	1.76 (1.17)	.54			
I think it would cost too much to eat a Mediterranean diet	Physical Capability	2.29 (1.38)	.51			
I find it hard to prepare a meat-free meal	Physical Capability	2.21 (1.38)	.75			
I have no time to plan a Mediterranean/ meat-free meal	Psychological Capability	2.05 (1.30)	.65			
I don't know any meat-free recipes	Psychological Capability	2.14 (1.38)	.77			
I don't know any Mediterranean diet recipes	Psychological Capability	2.42 (1.43)	.68			
I don't know what to eat instead of meat	Psychological Capability	1.98 (1.24)	.69			
I don't know what the recommended meat portion size are	Psychological Capability	2.11 (1.27)	.49			
I am too rushed at dinnertime to change what I cook	Physical Opportunity	1.97 (1.28)	.52			
It would take too long to make a Mediterranean meal	Physical Opportunity	1.98 (1.23)	.76			
It would take too long to make a meat-free meal	Physical Opportunity	1.92 (1.20)	.75			
I would not have the ingredients to make a Mediterranean meal	Physical Opportunity	2.13 (1.34)	.73			
I would not have the ingredients to make a meat-free meal	Physical Opportunity	2.14 (1.36)	.72			
I would have to go food shopping more often if I made a meat-free meal	Physical Opportunity	2.16 (1.33)	.58			
I would have to go food shopping more often if I made a Mediterranean meal	Physical Opportunity	2.23 (1.30)	.61			
I never try new recipes on the weekend	Physical Opportunity	1.88 (1.24)	.55			
Factor 2: Meat Dependence (Capability, Motivation; α = .95)						
I believe that meat is essential for protein	Psychological Capability	3.31 (1.37)		.75		
I believe that eating meat is necessary to be healthy	Psychological Capability	3.09 (1.43)		.80		
It is not possible to have an adequate diet without eating meat	Psychological Capability	2.58 (1.44)		.65		

(*continued on next page*)

Table 3 (*continued*)

Mediterranean diet barrier items	COM-B component	*M (SD)*	Factor loadings			
			1	2	3	4
I don't think legumes are a good replacement for meat	Psychological Capability	2.43 (1.44)		.47		
I don't think reducing meat consumption prevents disease (e.g., heart disease, cancer)	Psychological Capability	2.42 (1.39)		.67		
I think it is healthy to eat red meat on a regular basis	Psychological Capability	3.01 (1.37)		.77		
I don't think reducing red meat is better for the environment	Psychological Capability	2.46 (1.45)		.77		
I will not prevent animal suffering by reducing my meat consumption	Psychological Capability	2.45 (1.42)		.65		
I think plant-based meat alternatives are unhealthy	Psychological Capability	2.21 (1.36)		.49		
Meat is quick and easy to cook for dinner	Physical Opportunity	3.35 (1.32)		.55		
There are no good alternatives to meat	Psychological Capability	2.65 (1.52)		.60		
I rarely have interactions with people who have reduced or are interested in reducing their meat consumption	Social Opportunity	2.71 (1.45)		.49		
I never feel guilty when eating meat	Automatic Motivation	3.40 (1.51)		.74		
If I was forced to stop eating meat I would feel sad	Automatic Motivation	2.91 (1.56)		.68		
I feel light and good after eating red meat	Automatic Motivation	2.58 (1.32)		.65		
I think meat is delicious	Automatic Motivation	3.82 (1.25)		.72		
I think a meal without meat is not satisfying (filling)	Automatic Motivation	2.63 (1.49)	.32	.56		
I think to eat meat is an unquestionable right of every person	Reflective Motivation	3.01 (1.50)		.77		
I would not eat plant-based meat alternatives because it seems unnatural	Reflective Motivation	2.75 (1.57)		.60		
Factor 3: Food Allergies and Clean Eating (Capability, Motivation; α = .71)						
I am allergic/ intolerant to legumes (e.g., beans, lentils, chickpeas)	Physical Capability	1.30 (0.82)			.60	
I am allergic/ intolerant to gluten (e.g., pasta, wheat)	Physical Capability	1.39 (0.98)			.54	
I think fish is unhealthy	Psychological Capability	1.30 (0.90)			.53	
I don't like the taste of white meat (e.g., chicken, turkey)	Automatic Motivation	1.32 (0.82)			.64	

Table 3 (*continued*)

Mediterranean diet barrier items	COM-B component	*M (SD)*	Factor loadings			
			1	2	3	4
Factor 4: Household Dietary Preferences (Opportunity; α = .83)						
People I live with would not eat a Mediterranean diet	Social Opportunity	2.18 (1.41)				.59
People I live with would not reduce their meat consumption	Social Opportunity	2.51 (1.52)				.62
People I live with would not eat legumes (e.g., beans, lentils, chickpeas)	Social Opportunity	2.21 (1.49)				.73
People I live with would not eat tofu	Social Opportunity	2.93 (1.73)				.71
People I live with would not be supportive of me reducing my meat consumption	Social Opportunity	2.12 (1.40)				.59

adoption in initial correlation analyses, $r(441) = .48$, $p < .001$.

In step one of the hierarchical multiple regression, *Mediterranean Diet Familiarity* explained a significant 21.2% of the variance of the likelihood of adopting the Mediterranean diet, adj. $R^2 = .43$, $F(1,441) = 118.4$, $p < .001$. In step two, the four barrier factors were added to the regression equation and explained an additional 14.5% of the variance in adoption likelihood, $\Delta R^2 = .15$, $\Delta F(4,437) = 24.7$, $p < .001$. In step three, with the significant individual question '*Not Having to Cook for Others*' added, the regression equation explained an additional 8.3% of the variance in adoption likelihood ($\Delta R^2 = .083$, $\Delta F(1,436) = 64.7$, $p < .001$). Combined, the variables in model three explained 44% of the variance of Mediterranean diet adoption, adj. $R^2 = .43$, $F(6,436) = 57.1$, $p < .001$. Examining beta-coefficients highlights that *Familiarity, Meat Dependence, Lack of Time and Knowledge, Food Allergies and Clean Food, Household Dietary Preferences,* and *Not Having to Cook for Others* all explained significant amounts of variance in the likelihood of adopting the Mediterranean diet. Participants' scores on these factors predicted whether they were likely to adopt the Mediterranean diet. Hypothesis 3 is supported. A summary of the regression analysis is presented in Table 4.

4. Discussion

The aim of the current study was to quantitatively identify key barriers to adopting the Mediterranean diet in adults living in a high-meat consumption and high-income country (Australia) using the capability-opportunity-motivation (COM-B) framework. Consistent with past research in non-Mediterranean countries (Allenden et al., 2024; Scannell et al., 2020), more than two-thirds of our sample ate a high-meat omnivore diet, with only 16% identifying as Mediterranean diet eaters. This eating pattern has also become commonplace in Mediterranean countries (Biggi et al., 2024) signifying the expanse of the high-meat Western diet. Overall, our findings emphasise the immense scope to increase uptake of the Mediterranean diet in Australia with all the attendant positive consequences for GHG emissions reduction, human health, and animal welfare.

In our Australian sample, we found that meat and meat replacement consumption significantly differed across the three diet groups, with omnivore eaters consuming red meat significantly more often and legumes significantly less often than those who ate a Mediterranean or flexitarian/semi-vegetarian diet, generally supporting Hypothesis 1. Qualitative studies have found that reducing red meat and increasing legume consumption are common barriers to Mediterranean diet

Table 4
Hierarchical Multiple Regression results for the prediction of barriers to Mediterranean diet adoption.

	β	*95% CI for β*		*B*	*p-value*	sr^2
		LB	UB			
Step 1						
Familiarity	0.46	0.38	0.54	0.44	<.001	.212
Step 2						
Familiarity	0.32	0.24	0.41	0.31	<.001	.089
Meat Dependence	−0.13	−0.21	−0.05	−0.16	<.001	.016
Lack of Time and Knowledge	−0.29	−0.36	−0.21	−0.35	<.001	.081
Food Allergies and Clean Food	0.24	0.16	0.32	0.30	<.001	.054
Household Dietary Preferences	−0.07	−0.15	0.00	−0.09	.060	.005
Step 3						
Familiarity	0.26	0.179	0.34	0.25	<.001	.053
Meat Dependence	−0.11	−0.18	−0.03	−0.13	.004	.011
Lack of Time and Knowledge	−0.24	−0.31	−0.16	−0.29	<.001	.052
Food Allergies and Clean Food	0.17	0.098	0.25	0.21	<.001	.026
Household Dietary Preferences	−0.14	−0.21	−0.07	−0.18	<.001	.019
Not Having to Cook for Others	0.32	0.24	0.40	0.27	<.001	.083

Note: B = unstandardised beta, CI = confidence interval, LB = lower bound, UB = upper bound, r = correlation coefficient, sr^2 = squared semi partial correlation coefficient. Variance Inflation Factor (1.00 to 1.26) and Tolerance (.794 to 1.00) values confirmed that multicollinearity was not an issue among the predictor variables. Step 3 model: $R = .66$, $R^2 = .44$, $Adj\ R^2 = .43$.

adoption in non-Mediterranean countries (Moore et al., 2018; Tsofliou et al., 2022). The Mediterranean diet consists of limited red meat (i.e., once a week) and moderate (i.e., 2 to 3 days a week) to daily consumption of legumes (Bach-Faig et al., 2011; Serra-Majem et al., 2020), so changing these established patterns (i.e., automatic motivation per the COM-B), is essential for omnivores to adopt a Mediterranean diet.

Omnivore eaters were also less familiar with the Mediterranean diet than people who ate a Mediterranean or flexitarian/semi-vegetarian diet (supporting Hypothesis 2). Consistent with past research (Kretowicz et al., 2018; Scannell et al., 2020), most people had general awareness about the Mediterranean diet (e.g., it is healthy), but were less familiar with the specifics (e.g., reduced meat portions, limited red meat). Interestingly, people considered the Mediterranean diet to be environmentally friendly, which is promising given the recent focus on sustainable food consumption (IPCC, 2022). Biasini et al. (2023) also found that self-identity, measured as interest in sustainable eating, moderated the intention-behaviour relationship, with higher scores linked to higher intention and adherence. This suggests sustainable eating intentions can reinforce corresponding behaviour, underscoring the potential positioning of the Mediterranean diet as a 'sustainable diet.'

Exploratory factor analysis identified four underlying barrier factors in the Mediterranean diet barriers measure. While the 74 items were grounded in COM-B theory, we anticipated that barriers would cluster in ways that may not align neatly with the six COM-B components (physical and psychological capability, reflective and automatic motivation, physical and social opportunity) in this context. Indeed, the identified factors–*Lack of Time and Knowledge, Household Dietary Preferences, Meat Dependence,* and *Food Allergies and Clean Eating*–spanned COM-B components rather than mapping discretely onto single categories. For example, *Lack of Time and Knowledge* encompassed both capability (physical and psychological) and opportunity (physical), whereas *Meat Dependence* encompassed motivation (reflective and automatic), opportunity (social), and capability (psychological). These factors were consistent with past research, as highlighted below (Allenden et al., 2024; Papadaki et al., 2016; Scannell et al., 2020; Tsofliou et al., 2022).

The hierarchical regression analysis in step one revealed that participants' familiarity with the Mediterranean diet explained 21.2% of the variance in Mediterranean diet adoption. Low familiarity is a common barrier in non-Mediterranean countries (Moore et al., 2018; Scannell et al., 2020; Tsofliou et al., 2022), which may reduce people's psychological capability to adopt this diet. That is, people would be less likely to adopt the Mediterranean diet if they do not know what it entails, thus posing a vital barrier to address when designing interventions.

Results revealed that the four factors explained an additional 14.5% of the variance in people adopting the Mediterranean diet in step two of the hierarchical regression analysis (supporting Hypothesis 3). *Lack of Time and Knowledge* explained 8.1% of the variance for people to adopt the Mediterranean diet, indicating a reduction in people's physical opportunity and psychological capability, respectively. Specifically, participants perceived Mediterranean diet meals as inconvenient–increasing cooking and shopping time–and lacked knowledge of Mediterranean diet recipes, recommended meat portion sizes, and the use of legumes as a meat-replacement food. Lack of time and knowledge are common barriers in the meat-reduction and Mediterranean diet research, including Mediterranean countries (Allenden et al., 2024; Biggi et al., 2024; Malek et al., 2019, Middleton et al., 2015; Scannell et al., 2020), thus indicating reduced physical availability to prepare an unfamiliar Mediterranean meal and limited mental availability to plan and learn new recipes. Interestingly, our participants had less knowledge of Mediterranean diet recipes than meat-free recipes. A lack of knowledge of meat-free recipes is a common hindrance to adopting the vegan or vegetarian diet (de Boer et al., 2017), and people appear to have even less knowledge of Mediterranean diet recipes. This difference may be due to the vegetarian dietary movement that has recently expanded in Western countries (Hopwood et al., 2020; Ruby, 2012), resulting in greater awareness and access to meat-free recipes. Given competing commitments (work, study, and childrearing), it is understandable that people perceive dietary change as physically and mentally effortful (Allenden et al., 2024), particularly alongside strong eating habits (Rees et al., 2018).

Food Allergies and Clean Eating explained 5.4% of the variance in Mediterranean diet adoption, which likely reflects reduced capability (physical and psychological) and motivation (automatic) to adopt the diet. A small portion of participants who identified as allergic or intolerant to gluten and/or legumes nonetheless reported high adoption likelihood, which contrasts with our qualitative findings (Allenden et al., 2024) and quantitative findings that allergenic foods were a health barrier to adoption in Mediterranean countries (Biggi et al., 2024). The availability of gluten replacement foods (Mordor Intelligence, n.d.), and legume allergies being mostly from peanuts (Sasaki et al., 2018), may partly explain why participants in the current study were still likely to adopt the Mediterranean diet; and indeed a gluten-free version is a healthy alternative for those with this food allergy/intolerance (Bascuñán et al., 2020). A small percentage of participants who perceived fish as unhealthy tended to score higher on the diet adoption scale. This unhealthy perception of fish may relate to mercury levels reported to be observed in ocean-based fish (Food Standards Australia New Zealand, 2020) and negative media coverage of salmon farming in Australia (Minshull & Brown, 2017). As the Mediterranean diet includes moderate consumption of fish, these results were unexpected. However, these findings may, in part, relate to the diet being predominantly plant-based (Godos et al., 2024) and online messaging outlining the flexible nature of the diet, including without fish (Shaw, 2026). Nevertheless, these findings indicate that food allergies and perceived health concerns about fish may not represent a major barrier to Mediterranean diet adoption in this sample.

Meat Dependence also appeared to impact participants' motivation (automatic and reflective) and capability (physical and psychological) to adopt the Mediterranean diet. Despite a focus on meat reduction to support Mediterranean diet uptake, this factor only explained 1.6% of the variance in adoption. This may reflect the meat-reduced (i.e., not meat-exclusionary) features of the Mediterranean diet, particularly for

red meat (Bach-Faig et al., 2011). Consistent with past research in both the Mediterranean diet and meat reduction/exclusionary literature (Lacroix & Gifford, 2020; Malek et al., 2019; Stoll-Kleemann & Schmidt, 2017), most people perceived meat as tasty and filling, easy to cook, difficult to replace in a meal, and essential for health and protein. Legumes were not viewed as a meat replacement food despite their similarly high protein content, likely reflecting low nutrition knowledge (Didinger & Thompson, 2020). In contrast to past research (Allenden et al., 2024; Haigh et al., 2019), the taste and texture of legumes were not a key barrier, possibly because they were eaten across all diet groups, albeit less frequently for omnivore eaters.

Household Dietary Preferences presented as a social opportunity barrier and explained a small amount of the variance (0.5%) in Mediterranean diet adoption. Overall, participants perceived other household members as reluctant to eat a Mediterranean diet, to reduce their current meat levels, and to consume more legumes. Like meat exclusionary (i.e., vegan and vegetarian) diets (Lea & Worsley, 2003), family members can also hinder adoption of the Mediterranean diet, despite its greater flexibility. Moreover, Mediterranean diet adherence is lower for children and adolescents in Mediterranean countries than for older people (Idelson et al., 2017), indicating not only a trend towards Western dietary patterns (Rosi et al., 2024), but the potential influences on household eating patterns.

Overall, our findings emphasise the need to consider an individual within their social context. Further to this point, most households ate the same diet, which indicates that any dietary change should consider the whole household, particularly because eating dinner is often a shared activity in multi-person households (Allenden et al., 2024; Harrison et al., 2015).

Finally, *Not Having to Cook for Others* enhanced participants' social opportunity to adopt the Mediterranean diet and explained an additional 8.3% of variance in step three. Even if someone is personally motivated to eat the Mediterranean diet, cooking for reluctant household members may undermine their own adoption (Allenden et al., 2024; Papadaki et al., 2016), especially if others' dietary preferences favour meat. Despite all participants being the main or joint cook, implying some control over the process (Lacroix & Gifford, 2020), our results suggest that household members hold considerable sway over what is ultimately cooked and consumed at mealtimes. Household influences, particularly cooking for children, remain underexplored in both the meat reduction and Mediterranean diet literature (Kretowicz et al., 2018; Lacroix & Gifford, 2020; Stoll-Kleemann & Schmidt, 2017). Our study included a relatively small number of households with dependent children; future research could further assess barriers quantitatively specifically for this household type.

4.1. Intervention implications

The current study is the first to quantitatively assess barriers to Mediterranean diet adoption in a high-meat-eating non-Mediterranean country. Previous research has focused on 'at risk' health populations, qualitative and observational research (Davis et al., 2015; McEvoy et al., 2018; Murphy et al., 2022; Scannell et al., 2020; Zacharia et al., 2020), or quantitative research assessing Mediterranean countries (Biasini et al., 2023; Biggi et al., 2024). Exploratory factor analysis enabled us to identify barriers that naturally cluster in this context, which may be more practical for intervention design than predetermined categories. The cross-component factor structure suggests that barriers to Mediterranean diet adoption are interrelated rather than operating in isolation within discrete categories. Future research could use these emergent factors to develop validated barrier sub-scales specific to Mediterranean diet adoption in high-meat-eating populations.

The hierarchical regression analysis enabled us to assess the relative contribution of each factor to the likelihood of people adopting the Mediterranean diet, while also accounting for barriers that operated independently of the factor structure, i.e., *Familiarity with the Mediterranean diet* and *Not Having to Cook for Others*. These findings may inform the design of robust interventions that consider both internal and external influences on the adoption of the Mediterranean diet.

To further connect these findings to behaviour change theory and intervention design, we re-mapped the identified barrier factors onto COM-B components and corresponding Behaviour Change Wheel (BCW) intervention functions to illustrate potential leverage points for intervention design (see Table 5). Although the factors were derived empirically and do not map neatly onto discrete COM-B subcomponents, this re-mapping illustrates how each barrier reflects multiple interacting influences across capability, opportunity, and motivation. This reinforces the importance of designing interventions that target combinations of determinants rather than isolated factors. For example, barriers related to time and knowledge may require both education and environmental restructuring, while household influences highlight the need for interventions that extend beyond the individual to the social context.

Building on this mapping, the identified barriers highlight key leverage points for intervention, but translating these into actual behaviour change remains challenging. It is important to note that the current study measured likelihood of adopting the Mediterranean diet rather than actual behaviour. Despite most participants perceiving the Mediterranean diet as healthy (62.1%) and having positive attributes (58.2%), adoption likelihood remained moderate, with fewer than 40% reporting they were likely to adopt. This reflects the well-examined intention-behaviour gap, whereby favourable attitudes are necessary but insufficient for behaviour change (Fishbein & Ajzen, 2010). Consistent with this, Sundaraja et al. (2024) found that COM-B interventions targeting knowledge and motivation failed to close this gap in sustainable palm oil purchasing when opportunity-related barriers remained unaddressed. The theory of reasoned goal pursuit (Ajzen & Kruglanski, 2019; Menozzi et al., 2025) further reinforces that targeting intention determinants–such as the capability, opportunity, and motivation barriers identified here–is a critical step towards behaviour change, underscoring the practical considerations that follow.

Our findings emphasise the importance of raising awareness on the attributes of the Mediterranean diet and highlight education as a key intervention function, although insufficient by itself (Moore et al., 2018). Without considering the *habit strength* of eating different foods, education alone poorly predicts dietary change (Rees et al., 2018; Van't Riet et al., 2011). In the current study, red meat (*strong habit*) and legumes (*low habit*) are key foods to target, particularly for omnivore eaters, where education and training about small dietary shifts may reduce physical and mental effort and knowledge barriers (Lacroix & Gifford, 2020). A favourable perception of the Mediterranean diet is important for it to become an ingrained consumption pattern for individuals and households (Moore et al., 2018).

Building on the identified barrier factors, the present findings offer clear direction for intervention design. Barriers related to *Lack of Time and Knowledge* suggest the utility of education and training functions, such as providing simple Mediterranean diet meal plans, cooking demonstrations, or digital tools that reduce the cognitive and practical effort

Table 5
Mapping identified barrier factors to COM-B components and behaviour change wheel intervention functions.

Barrier Factor	COM-B Components	Example Intervention Functions
Lack of Time & Knowledge	Psychological Capability, Physical Opportunity	Education, Training, Environmental restructuring
Meat Dependence	Reflective & Automatic Motivation	Persuasion, Incentivisation
Household Dietary Preferences	Social Opportunity	Modelling, Enablement
Food Allergies & Clean Eating	Physical Capability, Reflective Motivation	Enablement, Education

required to change dietary habits. Environmental restructuring may also be beneficial, for instance through increasing the availability and visibility of Mediterranean diet ingredients or ready-to-use meal components. Barriers linked to *Meat Dependence* point to the relevance of persuasive strategies and reframing, such as highlighting the health and environmental benefits of reducing red meat and promoting legumes as satisfying, protein-rich alternatives. Finally, *Household Dietary Preferences* underscore the importance of social opportunity interventions, including modelling and enablement approaches that target the household unit, such as family-based meal planning or child-friendly Mediterranean recipes (Michie et al., 2011). Together, these examples illustrate how the empirically derived barriers can translate into targeted, theory-informed behaviour change strategies. A more detailed review of intervention function and strategies (including strategies used by people who have shifted from an omnivore to a sustainable diet) can be found at Allenden et al. (2024).

4.2. Limitations

The higher median age may limit generalisability, though given Australia's aging population (ABS, 2021), these findings may reflect current and future demographic trends. Furthermore, age has been identified as both a driver and barrier, with older people more likely to adhere to a Mediterranean diet; however, these results are specific to Mediterranean countries or rural USA (Tsofliou et al., 2022) and may be less relevant to our Australian sample.

The Mediterranean diet barrier measure is a new author-developed instrument informed by the COM-B model, as existing validated scales focussed strongly on meat-reduction rather than Mediterranean diet adoption. While past research (Allenden et al., 2024; Papadaki et al., 2016; Scannell et al., 2020; Tsofliou et al., 2022) and aspects of validated measures informed the survey development, the factor analysis conducted here was exploratory. Future research could use the emergent barrier factors to develop validated subscales specific to Mediterranean diet adoption in high-meat-consuming populations, particularly across international populations.

Furthermore, the authors collected meat and meat-replacement food consumption data rather than other key Mediterranean diet foods, such as fruit, vegetables, and grains, because the primary dietary shift required for Australians to adopt the sustainable Mediterranean diet is a significant reduction in meat consumption. Whereas other Mediterranean diet factors such as lifestyle and physical activity were outside the scope of this paper, future research may benefit from assessing all Mediterranean diet foods and lifestyle factors.

Finally, this study measured likelihood of adopting the Mediterranean diet rather than actual behaviour, using a single dependent variable. While the survey's presentation of the Mediterranean diet (pyramid, plate, and descriptive comparison with the omnivore diet) was designed to reduce misinterpretation and support the validity of participants' responses, a single item dependent variable limits reliability. Future research could employ validated scales of Mediterranean diet adherence (e.g., Biasini et al., 2023) to enable assessment of actual dietary behaviour.

5. Conclusions

People in high-income countries such as Australia tend to eat high-meat diets, contributing to the ever-increasing GHGs resulting from animal agriculture. The meat-reduced Mediterranean diet offers a realistic way to shift these entrenched eating habits to a lower emissions diet. Understanding key barriers to adoption is essential to develop robust interventions. In our Australian study, key barriers included: 1) low familiarity with the Mediterranean diet, 2) lack of time and knowledge, 3) meat dependence, and 4) household dietary preferences. Only cooking for yourself predicted greater adoption, which emphasises the influence of cooking for other household members. Interventions targeting these barriers are more likely to succeed because they address capability, opportunity, and motivation for diet shifts. Reducing red meat and increasing legumes are also central to aligning omnivores' eating habits with the Mediterranean diet. In Australia, there is no time to delay dietary change. This study provides clear evidence-based guidance for intervention design to accelerate that shift.

Ethical statement

Ethics approval was provided by the University of New England (Approval No. HE22-180). Informed consent was obtained from all participants prior to commencing the online survey.

CRediT authorship contribution statement

Nicole Allenden: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Validation, Writing – original draft, Writing – review & editing. **Keri L. Phillips:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Writing – review & editing. **Amy D. Lykins:** Conceptualization, Methodology, Supervision, Writing – review & editing. **Donald W. Hine:** Conceptualization, Formal analysis, Investigation, Methodology, Supervision, Writing – review & editing. **Suzanne Cosh:** Conceptualization, Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2026.103160.

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