

1 **Title: We have taken your advice and changed the title to: Comparison of barriers and**  
2 **facilitators of MIND diet uptake among adults from Northern Ireland and Italy.**

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22 **Abstract**

23 **Background:** The aim of the study was to identify and compare components of the COM-B  
24 (capability, opportunity, motivation and behaviour) model, that influences behaviour to modify  
25 dietary patterns in 40-55-year olds living in Northern Ireland (NI) and Italy, in order to reduce  
26 the risk of cognitive decline in later life.

27 **Methods:** This was a qualitative study examining factors influencing Mediterranean-DASH  
28 (Dietary Approaches to Stop Hypertension) Intervention for Neurodegenerative Delay (MIND)  
29 diet behaviour. This study further elaborated the COM-B components into the 14 domains of  
30 the Theoretical Domains Framework to further understand behaviour. Twenty-five Northern  
31 Irish and Italian participants were recruited onto the study, to take part in either a focus group  
32 or an interview. Participants were both male and female aged between 40-55 years.

33 **Results:** Thematic analysis revealed that the main barriers to the uptake of the MIND diet were;  
34 time, work environment (opportunity), taste preference and convenience (motivation). Culture  
35 (motivation), seasonal foods and lack of family support (opportunity) to be a barrier to the  
36 Italian sample only. The main facilitators reported were; improved health, memory, planning  
37 and organisation (motivation) and access to good quality food (opportunity). Cooking skills,  
38 knowledge (capability) and healthy work lunch (opportunity) reported as a facilitator to the  
39 Italian sample only.

40 **Conclusions:** Cross-cultural differences in relation to psychosocial barriers and facilitators  
41 were found in both samples. More barriers than facilitators towards uptake of the MIND diet  
42 were found. There is a need for interventions that increase capability, opportunity, and  
43 motivation to aid behaviour change. The findings from this study will be used to design a  
44 behaviour change intervention using the subsequent steps from the Behaviour Change Wheel.

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46 **Keywords:** MIND diet, COM-B model, dementia, adoption, brain health, behaviour change

47 wheel

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## 50 **Background**

51           The global ageing population is increasing, with approximately 50 million people  
52 worldwide currently living with dementia, which is predicted to rise to 131 million by 2050  
53 [1]. The latest statistics on prevalence of dementia in Europe have shown that overall, Italy has  
54 the highest percentage (2.09%) of people living with dementia, compared to the average  
55 percentage of the rest of Europe (1.55%). In Northern Ireland, approximately 22,000 people  
56 are estimated to be living with dementia, which is 1.06% of the population. Longevity is  
57 increasing worldwide, therefore, there is an urgent need to identify potential modifiable risk  
58 factors such as diet to promote brain health from an earlier age.

59           There have been several prospective and cross-sectional studies that have attempted to  
60 gain insight into the relationship between the Mediterranean diet [2], DASH diet [3] and  
61 cognitive function. The Mediterranean diet is characterised by a high intake of plant food (fruit,  
62 vegetables, cereals and legumes), olive oil as the main source of fat, a moderate intake of fish,  
63 a low to moderate intake of dairy products and alcohol, a low intake of saturated fats, meat and  
64 poultry [4]. The DASH diet is similar to the Mediterranean diet, however, compared to the  
65 Mediterranean diet, the DASH diet requires high intake of low-fat dairy [5]. Prospective studies  
66 in the USA and Europe with both the Mediterranean and DASH diets over several years with  
67 older adults found an association with less cognitive decline [6,7], specifically, improved  
68 episodic, semantic, and working memory [8]. Furthermore, several cross-sectional studies in  
69 Italy and NI with older adults, found that close adherence to the Mediterranean diet was  
70 associated with lower cognitive impairment [9,10] and better cognitive function [11].

71           Prospective studies conducted in midlife over an extended 16-year period also showed  
72 a significant association with decreased risk of cognitive impairment [12] and improved  
73 psychomotor speed over a 4-month period in midlife [13]. Research has found that a healthy

74 diet in midlife is positively associated with cognitive function [14]. Moreover, research on both  
75 the DASH and Mediterranean diets have shown promising results in the protection against  
76 cardio risk factors for dementia [15]. However, the Mediterranean and DASH diets are not  
77 specific to the literature on nutrition and the brain. Therefore, a new diet called the  
78 Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) [16] diet was  
79 designed that incorporated many of the basic components of Mediterranean and DASH diet,  
80 but with modifications that reflect the best scientific evidence on nutrition and prevention of  
81 dementia [17].

82         The MIND diet promotes 10 healthy foods (Leafy greens, other veg, nuts, berries, fish,  
83 poultry, olive oil, beans, whole grains, red wine) and limits 5 other foods (red meat, butter,  
84 cheese, pastries and sweets, fried foods). While previous research shows that higher  
85 consumption of vegetables are associated with lower risk of cognitive decline [18,19], the  
86 strongest association is observed for higher intake of leafy greens [20,21]. Previous research  
87 on cognitive function or dementia do not observe protective effects for overall fruit  
88 consumption [20,21]. However, berries were shown to slow cognitive decline, particularly in  
89 global cognition and verbal memory in older adults [22].

90         There has been limited research to date investigating the effectiveness of the MIND  
91 diet. Morris et al. [23] originally devised the MIND diet and found that the diet can slow  
92 cognitive decline over an average of 4.7 years in adults aged 58-98 years old [23].  
93 Interestingly, recent research found that the MIND diet and not the Mediterranean diet,  
94 protected against 12-year incidence of mild cognitive impairment and dementia in older adults  
95 [24]. Also, a large observational study with older adults found that longer adherence to the  
96 MIND diet was associated with better verbal memory [25].

97         While there is little research on the social, environmental, and cultural perspectives of  
98 adopting the MIND diet, social and cultural changes have been shown to have contributed to

99 reversal of dietary habits in Southern European countries, with socio-economic variables  
100 highlighted as associated with adherence to a Mediterranean diet [26-28]. Social, cultural, and  
101 environmental factors have been found to be barriers in adopting a Mediterranean style diet  
102 [29,30]. British culture has been reported as being non-conducive to a Mediterranean dietary  
103 pattern [31], with barriers such as time, work and convenience influencing Mediterranean style  
104 diet behaviour [32,33]. Foods from a healthy dietary pattern may be more expensive to buy  
105 than those from a less healthy diet [34,35], and this may influence people's food choices [34].  
106 Therefore, a major barrier to consuming a Mediterranean style diet could be budget, especially  
107 for those of low socio-economic status. However, previous research has found, that while  
108 consuming healthier foods such as increasing wholegrains, fish, fruit and vegetables, may be  
109 more expensive, this cost could be reduced by reducing unhealthier foods such as red meat and  
110 sugary foods [36]. Identifying barriers and knowledge gaps towards Mediterranean style diet  
111 adoption, such as budget, time, convenience, and work, has implications for the design of  
112 behaviour change interventions aiming to promote dietary change [29].

113 As we are looking to promote healthy ageing, we are investigating modifiable risk  
114 factors in the prevention of cognitive decline. Research has found that a healthy diet in midlife  
115 is positively associated with cognitive function in later years [14,15]. Therefore, this study  
116 could add support to the dementia strategy research by exploring modifiable risk factors in the  
117 prevention of dementia, which could be applied globally.

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## 120 **Theoretical Framework**

121 The theoretical framework underpinning this research is the COM-B model [37].  
122 Changing behaviour involves changing one or more of the components of the COM-B model,  
123 which stand for, capability, opportunity, motivation, and behaviour (see Figure 1). Capability

124 can be either psychological (knowledge, psychological skills, or stamina) to perform the  
125 behaviour, or “physical” (having the physical skills, strength or stamina) to perform the  
126 behaviour. Opportunity can be divided into “physical” (what the environment allows in terms  
127 of time, resources etc) or “social” (interpersonal influences, social cues, cultural norms).  
128 Motivation can be divided into “reflective” (self-conscious planning and evaluations, beliefs  
129 about what is good or bad) or “automated” (wants and needs, desires, impulse and reflex  
130 responses) [37]. The Theoretical Domains Framework (TDF) facilitates understanding of  
131 health behaviours around evidence-based guidelines and provides a method to categorise  
132 behaviour [38]. Use of the TDF to identify factors influencing MIND diet behaviour can then  
133 be mapped onto the COM-B model for designing interventions. The TDF has 14 domains that  
134 may influence behaviour change [38] (see Figure 1).

135         The COM-B model is at the core of an overarching framework called the Behaviour  
136 Change Wheel [37] which is a three-stage approach to designing a behaviour change  
137 intervention. This framework includes 9 intervention functions (education, persuasion,  
138 incentivisation, coercion, training, restriction, environmental restructuring, modelling, and  
139 enablement linked to the COM-B model. These are how an intervention might change  
140 behaviour and are linked to behaviour change techniques [37]. BCTs are considered the active  
141 component of the intervention designed to change behaviour, such as self-monitoring of  
142 behaviour and goal setting. The COM-B model and TDF have been used by several studies to  
143 explore barriers and facilitators to behaviour change in sexual health [39], physical activity in  
144 obese pregnant women [40] and reducing sugar [41].

145         Previous research found differences in dietary patterns of people who live in Rome and  
146 NI, with NI consuming more ready-made meals [42], snacked between meals more often than  
147 Italians [43] and consumed more takeaway food, sugary drinks and less fruits and vegetables  
148 that those living in other Mediterranean countries [44]. Although the MIND diet is a hybrid of

149 the Mediterranean and DASH diets, it is a new diet that specifies foods such as berries, leafy  
150 greens, and wholegrains, which are not part of a traditional Mediterranean diet. Furthermore,  
151 the Mediterranean and DASH diets are not specific to the literature on nutrition and the brain.  
152 Therefore, the MIND diet was designed that incorporated many of the basic components of the  
153 Mediterranean and DASH diet, but with modifications that reflect the best scientific evidence  
154 on nutrition and prevention of dementia [17]. Comparing factors from the COM-B model  
155 (capability, opportunity and motivation) that may influence MIND diet behaviour across a  
156 Mediterranean and non-Mediterranean country, can reveal valuable insights that highlight  
157 diverse habits and beliefs across culture, which may be particularly informative in the  
158 development of behaviour change interventions.

159 The aim of the study was to establish and compare components of the COM-B model that  
160 influence the uptake of the MIND diet in a 40-55-year old Italian and Northern Ireland (NI)  
161 sample, that will inform a dietary behaviour change intervention.

162 Specific objectives were:

- 163 • To determine participants perceived capability, opportunity, and motivation to the  
164 uptake of the MIND diet in 40-55-year olds in a Mediterranean (Italy) and non-  
165 Mediterranean (NI) country.
- 166 • Compare barriers and facilitators to the MIND diet from a Mediterranean and non-  
167 Mediterranean country.
- 168 • Identify intervention functions and BCTs that are likely to change MIND diet  
169 behaviour.

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## 171 **Method**

### 172 **Participants and study design**



173 Part of the methods in this manuscript can also be seen in Timlin et al. [45]. Twenty-  
174 five participants from NI (Belfast, Armagh city, County Tyrone) (female 60%, male 40%) [45]  
175 and twenty-five participants from Rome, Italy (female 64%, male 36%) aged 40-55 years were  
176 recruited onto the study, to take part in either a focus group or an interview. Interview/focus  
177 groups took place in person (NI: 15 interviews, 2 focus group n=6, n=4; Italy 13 interviews, 2  
178 focus group n=6 n=6). Ethical approval was obtained from the School of Psychology Staff and  
179 Postgraduate Filter Committee at Ulster University, which is in accordance with The Code of  
180 Ethics of the World Medical Association (Declaration of Helsinki). Participants were  
181 approached by email, Facebook and advertisement booklet, which included some brief  
182 information about the study. Interested participants were asked to contact the researcher by  
183 email and sent a participant information sheet (PIS), consent form and information booklet on  
184 the MIND diet. Questions asked to participants were the same for both NI and Italian  
185 populations. Before the Italian interviews began, questions were translated from English to  
186 Italian by a fluent Italian speaker (BG). Questions were then back translated to English to  
187 ensure the interpretation of questions [46]. Most of the interviews were spoken in English (18)  
188 and those that were not were translated during the interviews by one of the Italian researchers  
189 (BG), to allow the English-speaking researcher (DT) to transcribe and analyse data from all of  
190 the transcripts. All interviews/focus groups were recorded and transcribed verbatim. The oral  
191 recordings and transcripts were sent to the Italian speaking researcher to check for missing  
192 data. Interviews were conducted in a private room at either a research centre or a community  
193 facility such as a library, convenient to the participant. In accordance with the COM-B  
194 framework, both focus groups and interviews were conducted [37] using semi-structured  
195 questions and lasting between 30-60 minutes each (see Table 1). The interview and focus group  
196 questions were based on guidance using the COM-B [37] model and TDF [38] (Table 1). The  
197 interview schedule was developed using the COM-B model, and informed the content analyses,

198 as seen in previous research conducted with the NI population of this research, as seen in  
199 previous research conducted with the NI population of this research [45]. All participants were  
200 asked to complete a personal information form and consent form before the interview/focus  
201 group began. The information form contained questions on participants diet at baseline (see  
202 Table 2) and showed that those living in NI consumed more red meat, fried food, butter, and  
203 sugary foods than those living in Italy. Participants were informed that the study was voluntary  
204 and that they could withdraw at any time. They were assured of confidentiality regarding any  
205 personal information they supplied to the researcher. It has been suggested by similar  
206 theoretical models, that 25 participants is the ideal sample size for qualitative research [47].  
207 Also, similar to other qualitative studies using the COM-B and TDF [39,40], twenty-five NI  
208 and twenty-five Italian participants were recruited onto the study, to take part in either a focus  
209 group or an interview.

210

## 211 **Materials and procedure**

212 A topic guide was developed using the TDF. An example of a question related to TDF  
213 knowledge was, “what is your understanding of the MIND diet”. A further question exploring  
214 participants skills was, “to what extent are you confident in cooking MIND diet foods”. The  
215 TDF represents an elaboration of the COM-B’s six components into 14 domains, covering a  
216 wide spectrum of behavioural determinants (see Table 1). A booklet containing information on  
217 the elements of the MIND diet, and the origins of the diet were given to participants. An in-  
218 depth discussion on the MIND diet components was discussed prior to interview and focus  
219 groups. All interviews and focus groups were audio recorded.

## 220 **Data Analyses**

221 The data analyses has been described in full in Timlin et al. [45]. Two researchers (one  
222 English speaking and one Italian/English speaking) (DT&BG) independently read through the

223 entire dataset and coded the data from each transcript and assigned initial “code names”. There  
224 was a 95% agreement on codes between the two main researcher, which demonstrates an  
225 acceptable level of agreement [49]. However, any differences in coding were resolved with  
226 discussion between the researchers. Summative content analysis [50] was applied as an  
227 additional step in the analysis following agreement of codes. This involved two researchers  
228 searching the text for occurrences of codes, that were counted to identify the frequency of each  
229 code. Using a common approach [51,52], TDF domains were judged based on the frequency  
230 count of coding for each TDF domain, which had been aggregated from all the factors, beliefs  
231 or phrases mentioned that fell within that domain. For example, some participants reported that  
232 they believed the MIND diet would make them feel better generally. This belief statement is  
233 coded under the TDF domain “belief about consequences.” The frequency coding identified  
234 which TDF domains were most commonly reported, establishing the main barriers and  
235 facilitators to the uptake of the MIND diet.

## 236 **Results**

237 Table 3 reports the characteristics of a total sample, including 25 Italian and 25 NI  
238 participants. Transcripts provided data from 12 of the 14 domains of the TDF in the Italian  
239 sample, all 14 domains of the TDF in the NI sample and all components of the COM-B model  
240 for both samples (see Table 4 and 5). The most commonly reported barriers and facilitators fell  
241 into: Environmental Context and Resources, Belief about Capabilities, Belief about  
242 Consequences, Social Influences, Skills and Knowledge. None of the data fell into,  
243 reinforcement and goals, which were the least reported domains in the NI study (See Table 6  
244 and 7 for quotes).

## 245 **Capability**

246 Psychological capability was a COM-B component identified as a barrier to adherence  
247 to the MIND diet. Twenty percent of the barriers in the Italian sample fell into the psychological

248 component of the COM-B model compared to 29% in the NI sample. These barriers fell into 2  
249 of the TDF domains, behaviour regulation and knowledge. None of the Italian barriers fell into  
250 attention and decision process domain, unlike the NI sample, where 10% of barriers fell into  
251 this domain.

252 **Knowledge:** Similar to the NI sample, all Italian participants reported never having previously  
253 heard of the MIND diet. Italian participants reported that they recognised that the MIND diet  
254 was similar to the Mediterranean diet and to their own diet.

255 **Behaviour regulation:** This domain is defined as “*anything aimed at managing or changing*  
256 *objectively observed or measured actions*”[38], such as self-monitoring. In both samples, most  
257 of the participants did not monitor their food intake. However, some participants reported that  
258 they use to record their food intake to monitor what and how much they ate but are now able  
259 to control their diet from memory.

260 **Physical Capability: Skills:** Physical skills are defined as the level of self-efficacy in  
261 cooking/eating with MIND diet foods. Skills were reported as a facilitator in both the NI (12%)  
262 and Rome samples (8%). Skills were reported as a key barrier only in the NI sample, with 6%  
263 of barriers falling into this domain. All participants in the Rome sample reported being  
264 confident cooks, even if they didn’t like or cook certain foods, whereas, in the NI sample, it  
265 was reported that those who couldn’t cook generally were married men and those participants  
266 who reported that they didn’t like certain foods, were not confident in cooking them.

## 267 **Opportunity**

268 According to the COM-B model, for behaviour to occur, there must be a physical and  
269 social opportunity in the environment. Barriers relating to physical opportunity were the most  
270 commonly reported barriers in both the NI and Italian populations, with 29% of all utterances  
271 falling into this component in the NI sample and 33% in the Italian sample. The TDF domain

272 related to this component is; environmental context and resources. Social opportunity was  
273 reported as being a key barrier and facilitator in both the NI and Italian samples, with 13% of  
274 all facilitators and 5% of barriers falling into this component from the NI sample, 15% of all  
275 barriers and 12% of facilitators from the Italian sample. The TDF domain related to this  
276 component is social influence.

277 ***Environmental context and resources:*** This domain is defined as any circumstance of a  
278 person's physical environment or situation that could support or hinder the development of  
279 skills and abilities [38]. For example, budget, time, inability to cook or shop, availability of  
280 quality foods. The work environment was reported as a barrier to eating the MIND diet foods  
281 by both NI and Italian samples. It was reported that canteen food can be unhealthy and that  
282 there is the temptation to eat more quantity of food. Several participants reported that if they  
283 did not have lunch with them, they would eat out in a café or buy lunch from a bakery which  
284 would less healthy. Time was a major barrier reported by both samples, particularly for those  
285 that were in employment, however, their reasons for *time* being a barrier differed. For the NI  
286 participants, it was more a matter of convenience that they had been working all day, having  
287 maybe taken children to after school activities, and did not have the *time* to cook with fresh  
288 foods. The Italian population reported *time* as barrier in the same manner, but also, the *time* to  
289 travel to access fresh food in the farmers markets in the country, especially for those living in  
290 the city.

291 Budget was also reported as a major barrier to buying several of the MIND diet foods  
292 such as fish, berries, and nuts in both populations. However, this was only the view of those  
293 participants in low paid jobs or unemployed in the NI sample. Several participants from the  
294 Italian sample, who were all professional or skilled workers, reported *budget* to be a barrier,  
295 especially with regards to fish and wholegrains.

296           Treats such as cakes and sweets in the home and workplace were reported as being a  
297 major barrier in adhering to the MIND diet in the NI sample. Participants reported that having  
298 *treats* in the house for guests and children would hinder them in adhering to the MIND diet as  
299 they often eat the *treats* themselves. Also, NI participants reported that *treats* in the workplace  
300 were common, that there were always biscuits available and that this would be a hindrance to  
301 adhering to the MIND diet. However, *treats* in the workplace were not reported by the Italian  
302 sample, in fact, when asked if biscuits were commonly found in the workplace, participants  
303 reported that it was only on occasion that biscuits or *treats* were offered at work, such as,  
304 someone's birthday.

305           A major barrier reported by the Italian sample and a key difference between both  
306 samples, was access and availability of certain foods of the MIND diet. Most Italian  
307 participants reported that the availability of berries out of season were scarce. One participant  
308 reported that, Italy provides so many different, tasty fruit, that they would not choose berries  
309 that were hard to find and expensive. Several participants also reported that wholegrains were  
310 expensive and hard to find. Italian participants also reported that access to fresh fruit,  
311 vegetables and fish may hinder them in adhering to the MIND diet, especially those that lived  
312 in the city of Rome. Participants reported that the fish and fruit produce in the city is more  
313 expensive and poorer quality than in the country and that they would consume less of these  
314 because of this reason. In contrast, the NI sample reported that the fruit and vegetables were  
315 more expensive and of poorer quality in the country and small towns, and that they would have  
316 to travel to the bigger stores to access cheaper better-quality food.

317           Both samples reported that bringing their lunch to work, would help facilitate adherence  
318 to the MIND diet. Participants reported, that in order to consume the MIND diet at work, they  
319 would need to bring their own lunch to prevent them from eating out. Many participants from  
320 the Italian sample already brought a healthy lunch to work, such as salad, which they perceived

321 would help prevent barriers in adhering to the MIND diet, as they could take a lunch to work  
322 containing MIND diet foods.

323 **Social Influence:** This domain is described as the “*interpersonal processes that can cause*  
324 *individual to change their thoughts, feelings or behaviours, which may be due to social*  
325 *pressure, norms, social/family support or peer pressure*” [38]. A key barrier reported by both  
326 samples was visiting family/friends. Both samples reported that either going out to visit friends  
327 or family coming to visit resulted in eating unhealthier and more quantity. However, the NI  
328 sample reported eating more fast foods, while the Italian sample reported cooking more  
329 unhealthily, such as lasagne, cheese and pasties and more quantity. Family support/influence  
330 was reported as a key facilitator by both samples. Participants from NI sample reported that  
331 they felt their family would support them if they were to uptake the MIND diet. Another key  
332 barrier under this domain which was only reported by the Italian sample, was *lack of family*  
333 *support/influence*. Participants often reported avoiding certain foods such as wholegrains or  
334 eating less healthy foods such as vegetables, as other family members did not like them. Also,  
335 several participants reported that their family would not support them in this diet, particularly  
336 those who originate from the South of Italy, where eating more food and more unhealthily is  
337 typical of their culture.

### 338 **Motivation.**

339 Motivation is a component of the COM-B model and there must be strong motivation  
340 for the behaviour to occur [33]. Participants reported reflective motivation to be a barrier to the  
341 uptake of the MIND diet and 18% of barriers fell into this component of the COM-B model,  
342 compared to 15% in the NI study. More facilitators were reported under this domain with 33%  
343 from the NI sample and 37% from the Rome sample.

344 **Belief about capabilities:** The extent to which the individual believes they were able to adhere  
345 to the MIND diet. Taste preference was reported as a major barrier to the adherence of the  
346 MIND diet in both the NI and Italian populations. Participants reported not liking various  
347 elements of the diet such as fish, vegetables, and chicken. However, many of the participants  
348 in the Italian sample reported not liking wholegrains, in particular, wholegrain pasta or bread  
349 and even if they did like it, they would not buy it as their children did not eat it. Convenience  
350 was also reported as a barrier to the uptake of the MIND diet in both samples. Both samples  
351 reported cooking less healthy food to suit their children and eating it themselves rather than  
352 making two meals for *convenience*.

353 Mindset was reported by both samples as a barrier to the uptake of the MIND diet. The  
354 NI sample reported that being in the right mindset was important to change diet and to be  
355 determined to do so. However, the Italian sample reported the difficulty they perceived in  
356 reducing certain foods, such as cheese. Many Italian participants reported that they would not  
357 be able to do this. Belief about capabilities were also reported as being a major facilitator in  
358 the uptake of the MIND diet with 16% of all barriers falling into this domain in both samples.  
359 While both samples reported that being organised and prepared when cooking meals or having  
360 lunch prepared for work was a facilitator, the Italian participants reported that the MIND diet  
361 seemed similar to their own diet and would be easy to follow. They also reported that the MIND  
362 diet allowed for simple meals such as pasta and vegetables which is quick and easy to make.

363 **Professional, Social and Identity:** How the individual viewed the uptake/maintenance of the  
364 MIND diet relative to their identity (for example, parent, culture). Culture was reported as both  
365 a barrier (3%) and a facilitator (7%) under this domain from the Italian sample only.  
366 Participants reported that the MIND diet was similar to their own diet and the Mediterranean  
367 diet. Participants reported that as they ate most of these foods, that this would help them adhere  
368 to the MIND diet. They also reported that butter is not part of their diet, they only use olive oil



369 which further supports uptake of the MIND diet. However, most participants reported that not  
370 only were berries hard to find out of season, but they were not part of their culture. Some  
371 participants also reported that wholegrains were not part of their culture and it would not be  
372 acceptable to serve wholegrains to family and friends. It was also reported that cheese is a big  
373 part of the Italian culture and reducing cheese would be difficult to do.

374 ***Belief about consequences:*** This domain is described as, anticipated outcomes of not eating  
375 brain healthy foods, anticipated or experienced outcomes of eating brain healthy foods.  
376 (positive or negative). Belief about consequences was reported as a major facilitator in both  
377 samples with it being the most reported facilitator in the NI sample (17%). Both samples  
378 reported that if they adhered to the MIND diet, they believed it would be good for their overall  
379 health, less sleepy and improve mental health. However, some of the Italian participants  
380 recognised that with more fibre from the wholegrains and less cheese, that this would have a  
381 benefit for their bowels and cholesterol.

382 ***Emotion:*** Both samples reported that they would feel positive about following the MIND diet  
383 with 7% of facilitators falling into this domain in the Italian sample and 9% in the NI sample.  
384 However, similar to NI participants, even though participants felt positive about the MIND  
385 diet, this did not necessarily coincide with their intention to uptake the diet.

## 386 **Discussion**

387 To our knowledge, this is the first study investigating adherence to the MIND diet at  
388 midlife (40-55 years old) in a Mediterranean and non-Mediterranean country. This study  
389 addresses this gap in the literature and highlights cross-cultural perceived barriers and  
390 facilitators to adhering to the MIND diet at midlife. Results found that the main barriers and  
391 facilitators reported were; environmental context and resources, belief about capabilities, social  
392 influence, behaviour regulation, knowledge, skills, belief about consequences, emotion,

393 memory, attention and decision making, and professional, social identity, which can be mapped  
394 onto the COM-B model (see Figure 1). This is the first study to use the COM-B model to code  
395 and analyse cross-cultural qualitative responses from individuals at midlife regarding MIND  
396 diet behaviour. The reason for this, was to ensure our findings were grounded in theory and  
397 identify the main components of an intervention that could change and maintain behaviour.

398         Similar to the NI sample, the Italian key barriers reported were: environmental context  
399 and resources, belief about capabilities, behaviour regulation and knowledge. However, skills,  
400 and memory, attention and decision processes were not reported as key barriers in the Rome  
401 population. Instead, social influence and social, professional and identity were reported as key  
402 barriers to the uptake of the MIND diet. Key facilitators reported were environmental context  
403 and resources, belief about capabilities, belief about consequences, social influences, skills,  
404 and emotion. The Italian sample reported one further facilitator which was social, professional  
405 and identity. Our results confirmed previous research finding regarding commonly reported  
406 barriers and facilitators to adherence to healthy dietary change, including *budget* [53], *time* and  
407 *taste preference* [54] and *family influence* [55].

408         Similar to the NI population, the Italian sample reported having no knowledge of the  
409 MIND diet prior to the study or what constituted brain healthy food. Nicklas et al. [56] found  
410 that lack of knowledge regarding dietary recommendations and health benefits were reported  
411 as a key barrier in meeting dietary recommendations, and lack of information on healthy food  
412 was also reported as a major barrier [57].

413         Lack of monitoring food intake was reported by both samples, highlighting “capability”  
414 as major barrier to the uptake of the MIND diet. Previous research found an association  
415 between behaviour regulation and changes in dietary outcomes [58], with self-monitoring  
416 specifically associated with a positive change in diet [59,60]. Self-monitoring is shown to not

417 only increase awareness of eating patterns [61-62], but also allows professionals to identify  
418 food aversions/intolerances and poor food choices [62].

419           Opportunity was highlighted as a key barrier to the uptake of the MIND diet. The main  
420 difference between the two samples was due to social influences being reported as a barrier in  
421 the Italian sample but not the NI sample. Environmental context and resource was a major  
422 theme to emerge with “Time” being a key factor in both samples, mainly reported by those  
423 who led busy lives. This finding supports previous research that found “Time” to be a barrier  
424 to eating a healthy diet [63,64]. Busy lifestyle was found to be associated with less home  
425 cooked meals [57] and poorer eating habits (65-67).

426           “Budget” was also found to be a significant barrier in both samples, which was mainly  
427 due to the healthy elements of the MIND diet, such as fish, wholegrains, berries, and nuts.  
428 These findings support previous research that found the cost of food to be a significant factor  
429 in people’s choice of food and consumption [68], and that higher adherence to a whole dietary  
430 pattern such as the Mediterranean diet, had higher cost associated with the healthy elements of  
431 the diet (fish, fruit, vegetables, nuts), and lower cost to the unhealthy elements of the diet  
432 (processed meat and sweet) [57,69]. These findings are further supported in Roa et al. [70] that  
433 found unhealthy processed foods to be less expensive than fruit, vegetables, and nuts. However,  
434 Roa et al. [70] explained that the higher cost could be offset by reducing the amount of  
435 unhealthy food consumption. Further support for this was found in Germani et al. [71] who  
436 compared the cost of a 4-member family with the cost of the same family following the  
437 Mediterranean diet and found that the cost of the Mediterranean diet was slightly higher in the  
438 overall budget. However, following an increase in the budget for healthy foods such as fruit  
439 and vegetables and reducing the budget for unhealthy foods such as pastries and processed  
440 food, the overall cost for both diets were similar. It was therefore concluded that low adherence

441 to the Mediterranean diet was not associated with cost but a difference in allocating money to  
442 different food groups.

443 Access and availability of fresh food was reported as both a barrier and facilitator in  
444 both samples. However, the Italian sample reported it as a major barrier compared to the NI  
445 sample and for different reasons, mainly due to seasonal foods being unavailable and limited  
446 access to fresh foods reported by those living in the city. One interesting difference between  
447 the two samples under this barrier is that in NI, there is cheaper, better quality food in the bigger  
448 stores and cities. However, it was reported that it is in the country markets in Rome that  
449 cheaper, fresher food is found. The literature generally supports that access to fresh cheaper  
450 foods are a barrier in rural areas. Previous research found that shops selling healthier food was  
451 a long distance from country communities [72,73], and that limited access to food resources  
452 led to poorer dietary habits [74].

453 However, in line with our findings with the Italian sample, previous research found that  
454 those who had access to farmers markets or grew their own food, was a facilitator to healthy  
455 eating [75]. However, the Italian sample further reported that farmers markets only open in the  
456 morning which did not suit those who worked. This finding is supported in Smith et al. [76],  
457 that found farmers markets to have inconvenient times and low frequency. Barnridge et al. [77]  
458 found that participants reported eating the recommended daily fruit and vegetables when  
459 receiving nutrition education and access to a garden. However, those who received no nutrition  
460 education but access to the garden, did not report eating the recommended fruit and vegetable,  
461 suggesting that it is knowledge not access to the garden that was related to an increase in fruit  
462 and vegetable consumption.

463 Social influence was reported as a barrier to the uptake of the MIND diet by the Italian  
464 sample only, and as a facilitator by both samples. Family influence was reported as key barrier

465 in the Italian sample. This may be due to the Italian sample being influenced by their children  
466 with 72% of the sample having children in the home compared to only 44% of the NI sample.  
467 The Italian sample often reported that their children would not eat certain elements of the  
468 MIND diet such as wholegrains or vegetables, influencing their decision to buy or cook such  
469 foods. This finding is supported in the literature that the taste preference of family and friends  
470 is a barrier to healthy eating [57]. Furthermore, research found the preference of children and  
471 family to be an important barrier when adopting a healthier lifestyle, particularly with  
472 increasing consumption of healthy foods. However, family support and influence were also  
473 reported as a key facilitator in adhering to the MIND diet, which is consistent with previous  
474 research that found family support was associated with healthier foods [78,79].

475 Motivation was highlighted as a barrier and facilitator to the uptake of the MIND diet  
476 in both samples. A major barrier reported in both samples was belief about capabilities, with  
477 taste preference being a factor associated with adhering to the MIND diet. This finding is in  
478 line with previous research that found taste preference to be a barrier to healthy eating [57].  
479 Morrow et al. [80] found that men were more likely to eat healthily if they did not perceive  
480 taste to be a barrier. Many of the Italian participants reported that the MIND diet was very  
481 similar to their own diet and therefore, felt it would be quite easy to follow. Previous research  
482 found that level of education is associated with healthy eating [81-83] and the Italian sample  
483 are all educated with 76% of the Italian sample with a higher qualification compared to 36%  
484 of the NI sample with a higher qualification and 36% with no formal qualifications. Research  
485 found that level of nutritional knowledge is associated with length of education and awareness  
486 of food related issues, leading individuals to be more interested in a balanced dietary pattern  
487 [27,28]. However, the Italian sample perception of the MIND diet adherence ease may be  
488 attributable to their culture. The MIND diet is a Mediterranean style diet and many of the Italian  
489 participants reported following their cultural diet which is rich in fruit, vegetables, nuts, grains,

490 and olive oil, and that this in itself is a facilitator to adhering to the MIND diet. Research in the  
491 Mediterranean countries have found that the Mediterranean diet is progressively disappearing  
492 [84,85]. However, research estimating adherence to the Mediterranean diet in the  
493 Mediterranean countries using secondary data, found that Italy had the best adherence to the  
494 Mediterranean diet [86]. Even though Italians had the best adherence to the Mediterranean diet,  
495 it was still decreasing since the economic crisis [87].

496 Culture was also reported as a barrier to adhering to the MIND diet in the Italian sample  
497 only. Participants often reported that certain MIND diet foods were not typical of their culture  
498 and serving certain foods to family and friends were not acceptable, such as wholegrain pasta  
499 and bread. This finding is in support of previous research that found low consumption of  
500 wholegrains in a Spanish sample [88,89]. Baruth et al. [90], found family to be a barrier to  
501 healthy eating. It was reported in Baruth's study that pressure to eat more, and the expectation  
502 that women would not lose their curves, were barriers to healthy eating. Furthermore, the  
503 sample in Baruth's study was with African American women, and as food is a big part of  
504 socialising, and eating traditional food is an important to their cultural identity, African  
505 American women may feel pressure to eat more [90].

506 The findings from this study are important to understand behaviour in the context in  
507 which it occurs. These findings not only highlight the components of the COM-B/TDF that  
508 need to change in order change behaviour, but the cultural differences in terms of important  
509 factors that need addressed in intervention design. The development of an appropriate  
510 intervention depends on the understanding of MIND diet behaviour in context, and the findings  
511 from this study provides us with the necessary knowledge of factors influencing behaviour that  
512 will inform an intervention. This is important, as an intervention to change MIND diet  
513 behaviour in Northern Ireland, may not address the needs of those living in Italy. The COM-  
514 B model is at the core of an overarching framework called the Behaviour Change Wheel [37]

515 which is a 3-stage systematic approach to designing a behaviour change intervention. The  
516 research in this paper represents stage one, to understand behaviour in the context in which it  
517 occurs and identify what needs to change in order to change MIND diet behaviour.

518         Stage 2 identifies the best intervention functions that are most likely to be effective in  
519 changing the target behaviour in context. We found that 5 of the 9 intervention functions  
520 suggested by the BCW were most relevant to the COM-B behavioural analysis conducted in  
521 this study. The 5 intervention functions were: education (increasing knowledge), training  
522 (imparting skills), persuasion (influencing attitudes and actions), enablement (providing  
523 support to overcome barriers) and environmental restructure (to provide cues and prompts for  
524 desired behaviour) [37].

525         The third stage helps identify content of the intervention by selecting the most  
526 appropriate behaviour change techniques which best serve the intervention function. The  
527 Behaviour Change Technique Taxonomy v1(BCTTv1) [91], and the theory and techniques tool  
528 [92], identified which BCT's have direct links to the TDF domains being addressed in the  
529 MIND diet intervention. For example, the tool showed that there was a link between TDF  
530 behaviour regulation and self-monitoring of behaviour. Fifteen BCT's were identified as likely  
531 to be effective in delivering the intervention functions and bringing about change in MIND diet  
532 behaviour. Therefore, capability to promote adoption of the MIND diet will be addressed by  
533 offering demonstration and instruction on how to perform the behaviour, such as recipes,  
534 information on MIND diet food frequency and portion sizes. Opportunity to promote adoption  
535 of the MIND diet will be addressed by adding objects to the environment, prompts/cues,  
536 remove aversive stimuli such as removing unhealthy snacks, bringing lunch to work and social  
537 support. Motivation to promote adoption of the MIND diet will be addressed by a range of self-  
538 regulatory BCTs such as goal setting, problem solving, self-monitoring, action planning and  
539 information on health consequences. In particular, self-monitoring resources to enable

540 individuals to track their MIND diet behaviour and setting particular goals to meet the weekly  
541 MIND diet guidelines.

542

### 543 **Strengths**

544 To our knowledge, this is the first study to develop a “behavioural diagnosis” of factors  
545 influencing the uptake of the MIND diet in a Mediterranean and non-Mediterranean country.  
546 This was the first study to apply the TDF to explore people’s attitudes towards a whole dietary  
547 pattern and compare these attitudes between a Mediterranean and non-Mediterranean country.  
548 The COM-B model provides a more comprehensive explanation of adherence than existing  
549 models [37], making it easier to identify appropriate interventions. The COM-B model was  
550 used as an additional step in the data analysis, increasing the efficiency of the study and  
551 showing the framework to be adequate for its purpose.

### 552 **Limitations**

553 This study was undertaken in a small sample of Italian and Northern Irish men and  
554 women. Our findings in terms of barriers and facilitators reported are “perceived” and context  
555 based. Therefore, not only may the findings have limited value in predicting MIND diet  
556 behaviour, but also not be generalisable to the whole populations. However, generalisability  
557 was not the main aim of our study, rather to explore people’s attitudes and perceptions towards  
558 the uptake and adherence to the MIND diet, with the aim to inform an intervention. Another  
559 limitation of the study may be researcher subjectivity; however, two researchers identified the  
560 codes from the data, suggesting that the themes drawn have credence beyond the lead  
561 researcher’s interpretation. Focus groups run the risk of introducing bias [93], resulting from  
562 an individual’s desire to conform to social acceptability [94 ]. However, the focus group  
563 participants in this study were acquaintances, reducing the risk of social desirability. A



564 limitation of this study is that the two samples differ in terms of socio-economic status, with  
565 all the participants from the Italian sample being of high socio-economic status and  
566 approximately one-third of the NI participants of low socio-economic status, which may make  
567 comparisons more difficult. Further research should include participants across different  
568 socioeconomic backgrounds. Furthermore, half of the Italian participants spoke in Italian and  
569 some of the richness of the data may have been lost in translation. However, the second  
570 researcher (Italian) translated, transcribed, and analysed the data to maximise interpretation  
571 and understanding of the data.

572

### 573 **Conclusion**

574 The COM-B and TDF makes a novel application to understanding what would  
575 influence the uptake of the MIND diet. This research identified that the main barriers to the  
576 uptake of the MIND diet were; time, work environment (opportunity), taste preference and  
577 convenience (motivation), with culture (motivation), seasonal foods and lack of family support  
578 (opportunity) to be a barrier to the Italian sample only. The main facilitators reported were;  
579 improved health, memory, planning and organisation (motivation) and access to good quality  
580 food (opportunity). Cooking skills, knowledge (capability) and healthy work lunch  
581 (opportunity) being a facilitator to the Italian sample only. Developing interventions that target  
582 these salient barriers to MIND diet uptake will have greater potential to change behaviour.  
583 Following detailed behavioural analysis, we used the subsequent stages of the Behaviour  
584 Change Wheel to identify 5 intervention functions and 15 BCTs to address the barriers and  
585 facilitators to the uptake of the MIND diet.

586 The findings from this study recommends providing behaviour regulation techniques,  
587 such as self-monitoring of MIND diet behaviour to keep track of adherence to MIND diet  
588 recommendations, education to increase knowledge of MIND diet and its components,

589 improve skills by providing recipes and weekly food planner, and advice on how to include  
590 family in the promotion of MIND diet behaviour. Further strategies to overcome barriers to  
591 MIND diet behaviour are to provide advice on planning meals ahead of time to encourage  
592 adherence to the MIND diet, provide information on how to overcome workplace diet traps,  
593 such as bringing lunch to work and removing unhealthy snacks from work-desk. Future  
594 research can use the insight from this paper to test the effectiveness of the intervention  
595 functions and BCTs outlined in these findings. Furthermore, understanding barriers and  
596 facilitators towards uptake of the MIND diet may help health professionals working with  
597 individuals/communities to help prevent or reduce the risk of cognitive decline.

598

## 599 **Declarations**

### 600 **Ethics approval**

601 Ethical approval was obtained from the School of Psychology Staff & Postgraduate Filter  
602 Committee, Ulster University, which is in accordance with The Code of Ethics of the World  
603 Medical Association (Declaration of Helsinki).

### 604 **Consent for publication**

605 All participants provided written informed consent before participating in the study, which  
606 included consent to publish anonymous quotes from individual participants.

### 607 **Availability of data and material**

608 The dataset (individual transcripts) is not publicly available due to confidentiality and ethical  
609 reasons.

### 610 **Competing Interests.**

611 The authors declare they have no competing interests.

### 612 **Funding Sources**

613 This research is part of a PhD thesis funded by The Department for the Economy (DfE), the  
614 funding body for PhD research in Northern Ireland. The funding body had no role in the  
615 research.

#### 616 **Authors contributions**

617 DT/BG led the study and conducted all the interviews/focus groups. DT/BG also analysed,  
618 coded and interpreted the data. DT wrote the manuscript. ES was also closely involved with  
619 data analyses and coding of the data. ES, JMcC , AP, MG, EA, DC revised the manuscript  
620 critically for intellectual content. All authors read and approved the final manuscript.

#### 621 **Acknowledgments**

622 The authors would like to thank all the participants who took part in the study and also to the  
623 businesses that allowed access to their customers.

624

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**Table 1:** Interview/focus group questions asked to participants in accordance with the TDF and COM-B model.

COM-B	TDF	QUESTION
<b>Psychological Capability</b>	Knowledge.	What is your understanding of the MIND diet?
<b>Psychological Capability</b>	Memory, attention and decision processes.	To what extent is eating MIND diet foods something you normally do? ➤ Prompt: Do you eat MIND diet foods each day
<b>Psychological Capability</b>	Behaviour regulation	To what extent do you monitor whether you are eating MIND die foods ?
<b>Physical Capability</b>	Skills	To what extent are you confident in cooking/eating MIND diet foods?
<b>Social Opportunity</b>	Social influences	To what extent do/would your family or friends help or hinder you eating MIND diet foods? ➤ Prompt: Does/would your family support you in eating the MIND diet?
<b>Physical Opportunity</b>	Environmental context and resources.	Discuss anything in your work or/and home environment that might help or hinder you eating the MIND diet? E.g budget, time
<b>Reflective Motivation</b>	Social/Professional role and identity	To what extent would eating the MIND diet be accepted by your friends and family? ➤ Prompt: Do you think your family/friends influences what you eat?
<b>Reflective Motivation</b>	Belief about capabilities	How difficult/easy would it be for you to eat the MIND diet? ➤ Prompt: What are the barriers to consuming the MIND diet? ➤ Prompt: What are the facilitators to consuming the MIND diet?
<b>Reflective Motivation</b>	Optimism	To what extent are you confident that any barriers you may have to eating the MIND diet can be solved?
<b>Reflective Motivation</b>	Intention	To what extent do you intend to follow the MIND diet to promote brain health?
<b>Reflective Motivation</b>	Goals	To what extent would you like to follow the MIND diet?
<b>Reflective Motivation</b>	Belief about consequences	What do you think will happen if you eat the MIND diet? ➤ Prompt: Discuss any benefits to eating the MIND diet?
<b>Automatic Motivation</b>	Reinforcement	To what extent are there any incentives for you to the MIND diet?
<b>Automatic Motivation</b>	Emotion	How do you feel about eating the MIND diet?

902 COM-B: Capability (C): Psychological or physical ability to enact behaviour; Opportunity (O): Physical and social environment that enables behaviour.  
903 Motivation (M): Reflective or automatic mechanisms that activate or inhibit behaviour; Behaviour (B). TDF: Theoretical Domains Framework. [45]  
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906 **Table 2:** Percentage of participants food intake at baseline

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	More than once a day		Daily		2-3 times a week		Once a week		Less than once a week	
	Italy	NI	Italy	NI	Italy	NI	Italy	NI	Italy	NI
Fruit & Vegetables %	44	44	26	36	20	20	8	0	4	0
Beans and legumes %	4	0	0	4	44	20	40	24	12	52
Fish %	0	0	0	4	32	28	48	40	20	32
Poultry %	0	4	0	4	36	60	36	34	28	8
Wholegrains %	12	0	16	40	20	16	16	16	36	28
Nuts %	4	0	16	4	12	20	20	32	40	41
Red meat %	0	0	0	8	28	64	40	12	32	16
Cheese %	0	0	12	24	48	48	24	20	8	8
Fried food %	0	0	0	0	4	40	12	24	84	32
Butter %	0	20	0	52	8	12	20	4	72	13
Sweets/pastries %	0	16	8	28	44	20	8	20	40	12

918 NI=Northern Ireland N-50, numbers are in percentages

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920 Table 3: Summary Characteristics of Interview/Focus Group Participants(n=50)

Characteristic	Northern Ireland (N=25)	Italy (N=25)
Mean age(sd)	44(4.9)	46(4.2)
40-44	60(15)	36(9)
45-49	16(4)	44(11)
50-55	24(6)	20(5)
Gender		
Male	40(10)	36(9)
Female	60(15)	64(16)
Occupation		
Professional	44(11)	64(16)
Skilled	16(4)	36(9)
Unskilled	40(10)	0
Education		
Higher education	36(9)	64(16)
Further education	28(7)	36(9)
No formal qualifications	36(9)	0
Marital status		
Married	44(11)	44(11)
Co-habiting	4(2)	4(2)
Separated	4(2)	4(2)
Single	32(8)	32(8)
Widowed	4(2)	4(2)
Children in household		
Yes	44(11)	72(18)
No	56(14)	28(7)

921 Education: Level of education obtained within a discipline or profession. Higher education= undergraduate/postgraduate degree: Further  
 922 education= any study after secondary school that does not include higher education, such as higher national diploma, higher national certificate,  
 923 apprentices for industry such as hairdressing, plumbing. Sd=standard deviation N=50  
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928 **Table 4:** Barriers in rank order of utterances in relation to MIND diet in 40-55-year olds in  
 929 Rome and NI: COM-B and TDF domains

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**Italy**

**Northern Ireland**

COM-B	TDF	Rank order	Frequency of Utterances	% of utterances.	COM-B	TDF	Rank order	Frequency of utterances	% of utterances
Physical opportunity	Environmental context and resources	1	93	33	Physical opportunity	Environmental Context and resources	1	90	29
Social opportunity	Social Influence	2	43	15	Reflective motivation	Belief about capabilities	2	46	15
Reflective motivation	Belief about Capabilities	3	37	13	Psychological capability	Knowledge	3	37	12
Psychological capability	Behaviour regulation	4	29	10	Psychological capability	Memory, attention, Decision making	4	30	10
Psychological capability	Knowledge	5	29	10	Psychological capability	Behaviour regulation	5	24	7
Reflective motivation	Social, Professional and Identity	6	15	5	Physical capability	Physical skills	6	17	6
Reflective motivation	Belief about consequences	7	11	4	Social opportunity	Social Influence	7	15	5
Physical capability	Skills	8	9	3	Reflective motivation	Belief about consequences	8	12	4
Reflective motivation	Intention	9	9	3	Reflective motivation	Social professional and identity	9	12	4
Reflective motivation	Optimism	10	7	2	Reflective motivation	Intention	10	9	3
Automatic motivation	Emotion	11	4	2	Reflective motivation	Optimism	11	6	2
Automatic motivation	Reinforcement	0	0	0	Reflective motivation	Goals	12	5	2
Reflective motivation	Goals	0	0	0	Automatic motivation	Emotion	13	3	1
Psychological capability	Memory, attention	0	0	0	Automatic motivation	Reinforcement	14	1	0
			286	100				307	100

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Information above the thick black line represents the top 6 reported domains of the TDF and corresponding COM-B components. Eighty percent of the data fell into the top 6 TDF domains; COM-B: Capability (C): Psychological or physical ability to enact behaviour; Opportunity (O): Physical and social environment that enables behaviour. Motivation (M): Reflective or automatic mechanisms that activate or inhibit behaviour; Behaviour (B). TDF: Theoretical Domains Framework.  
 Utterances: Spoken word/words in relation to themes/subthemes emerging from questions asked regarding MIND diet. n=50

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937 **Table 5:** *Facilitators in rank order of utterances in relation to MIND diet in 40-55-year olds*  
 938 *in Rome and NI: COM-B and TDF domains*

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**Italy**

**Northern Ireland**

FACILITATORS COM-B	TDF	Rank order	Frequency of utterances	% utterances	COM-B	TDF	Rank order	Frequency of utterances	% of utterances
Physical opportunity	Environment context	1	48	21	Reflective motivation	Belief about consequences	1	28	17
Reflective motivation	Belief about Capabilities	2	36	16	Reflective motivation	Belief about capabilities	2	27	16
Reflective motivation	Belief about consequences	3	32	14	Physical opportunity	Environmental Context and resources	3	22	13
Social opportunity	Social	4	28	12	Social Opportunity	Social influence	4	21	13
Physical capability	Skills	5	19	8	Physical capability	Skills	5	20	12
Reflective motivation	Identity	6	16	7	Automatic motivation	Emotion	6	15	9
Automatic motivation	Emotion	7	16	7	Automatic motivation	Reinforcement	7	10	6
Reflective motivation	Optimism	8	10	4	Reflective motivation	Intention	8	6	4
Reflective motivation	Intention	9	10	4	Psychological capability	Behaviour regulation	9	4	2
Automatic motivation	Reinforcement	10	7	3	Reflective motivation	Optimism	10	4	2
Psychological capability	Regulation	11	4	2	Reflective motivation	Social/Professional and identity	11	3	2
Psychological capability	Attention	12	3	1	Psychological capability	Knowledge	12	3	2
Psychological capability	Knowledge	13	2	1	Psychological capability	Memory	13	1	1
			231	100				164	100

940 Information above the thick black line represents the top 6 reported domains of the TDF and corresponding COM-B components. Eighty percent of the data fell into the top  
 941 6 TDF domains; COM-B: Capability (C): Psychological or physical ability to enact behaviour; Opportunity (O): Physical and social environment that enables behaviour.  
 942 Motivation (M): Reflective or automatic mechanisms that activate or inhibit behaviour; Behaviour (B). TDF: Theoretical Domains Framework.  
 943 Utterances: Spoken word/words in relation to themes/subthemes emerging from questions asked regarding MIND diet. n=50  
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946 **Table 6: Quotes from barriers regarding uptake of the MIND diet in rank order**

947 Northern Ireland			Rome		
COM-B/TDF	SUB-THEME	QUOTE	COM-B/TDF	Subtheme	QUOTE
Physical opportunity: Environmental context	1. Time 2. Food environment at work/canteen 3. Budget 4. Treats in for kids.	"For me it is time, by the time you get home from work, and maybe have done overtime, you couldn't be bothered" "There is nothing healthy in a canteen"	Physical opportunity: Environmental context	1. Availability/ Access to food 2. Budget 3. Time 4. Season	"Finding berries and the cost of them are a barrier" "Berries are hard to find as they are seasonal, I only eat them in summer"
Reflective motivation: Belief about capabilities	1. Convenience 2. Taste preference 3. Mindset	"Kids don't want healthy stuff, so sometimes I have convenience stuff to make it easier for me" "I don't like fish, you know the strong smelling fishy fish"	Social opportunity: Social influence	1. Family influence 2. Visiting family And friends	"The problem is my family, they only eat white pasta" "I would cook more unhealthily and quantity if family are visiting"
Psychological capability: Knowledge	1. Lack knowledge of MIND diet and foods	"If you don't know what is healthy for your brain, you won't eat that way"	Reflective motivation: Belief about capabilities	1. Taste preference 2. Convivence Mindset	I don't buy the brown pasta as it is more expensive and it doesn't taste as nice as the white" "I don't eat vegetables, any kind of them" "I love cheese, I do not think I could eat less cheese"
Psychological capability: Memory, attention and decision process	1. Alcohol 2. Tired 3. Holidays	"If I had a good drink at the weekend, it would take Tuesday or Wednesday to get over it, and I wouldn't want to eat this food"	Psychological capability: Behaviour regulation	1. Self-monitoring	"No, I don't monitor my food intake"
Psychological capability: Behaviour regulation	1. Lack monitoring of food consumption	"No, I don't, and sure, when I go to weight watchers, I don't even do it"	Psychological capability: Knowledge	1. Lack knowledge of MIND diet.	"I have never heard of the MIND diet"
Physical capability: Skills	1. Lack cooking skills	"I couldn't cook that, if you handed me all the ingredients, I would be like, what am I doing with it"	Social, professional and identity.	1. Culture	"My family eat lots of food, lots of white pasta and cheese, this is typical of Southern Italians to eat more and are more overweight" "Berries are not part of our culture"

948 COM-B: Capability, Opportunity, Motivation, Behaviour. TDF: Theoretical domains framework

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951 **Table 7.** Quotes from participants regarding facilitators of uptake of the MIND diet.

Northern Ireland			Rome		
COM-B/TDF	SUBTHEME	QUOTE	COM-B/TDF	SUBTHEME	QUOTE
Reflective motivation: Belief about consequences	1. Feel better generally 2. Improve psychological health 3. Improve memory	"I think the diet would just help you feel better generally" "And even help your head, less stress and worry"	Physical Opportunity: Environmental context and Resources	1. Bring lunch 2. Time	"Here I bring lunch every day, it is very simple for me to prepare my salads so not a barrier" "Having the time to travel to get better quality food would be a facilitator".
Reflective motivation: Belief about capabilities	1. Planning/ preparation/ organisation	"Organisation and preparation the night before, so having your berries and salad ready for work"	Reflective motivation: Belief about capabilities	1. Normal diet 2. Simple meals 3. Organisation 4. Motivation	"sometimes it is easier for all the family if you can cook it quickly, like pasta and veg" "If you were motivated enough, I think you could overcome your barriers". "I think you need to plan and be motivated".
Physical opportunity: Environmental context and resources	1. Accessibility fresh/frozen food 2. Bring lunch to work	"I would go to Lidl, because it is cheaper and better quality" "In my work, you need to be prepared and bring lunch with you"	Reflective motivation: Belief about consequences	1. Overall health 2. Cholesterol 3. Lose weight 4. Fiber/bowel	"I think this diet could help you gain more health" "I think my bowels would work better on this diet" "I think with eating less cheese would be good for your cholesterol" "I think you could lose weight on this diet"
Social opportunity: Social influence	1. Family support/influence	"My mum is always cutting out articles showing me research on good and bad foods for your health.	Social opportunity: Social influence	1. Family support/ influence	"Yes, my wife would support me if I wanted to do this diet" "yes, I think if I was out with family, there would be more alcohol, unhealthy foods and less veg"
Physical capability: Skills	1. Confident cook	"I am pretty confident cooking these foods"	Physical capability: Skills	1. Confident cook	"Yes, I cook generally the same legumes, I don't like beans very much so I don't cook them often, but I am able to cook them"
Automatic motivation: Emotion	1. Positive	"I would be positive about it, I get excited trying new things"	Reflective motivation Professional, social and identity	1. Culture	"this is typical foods for me, this would not be difficult for me" "we don't eat butter, it is not in our culture, we use olive oil"
			Automatic motivation Emotion	1. Positive	"I would feel positive about doing this diet"

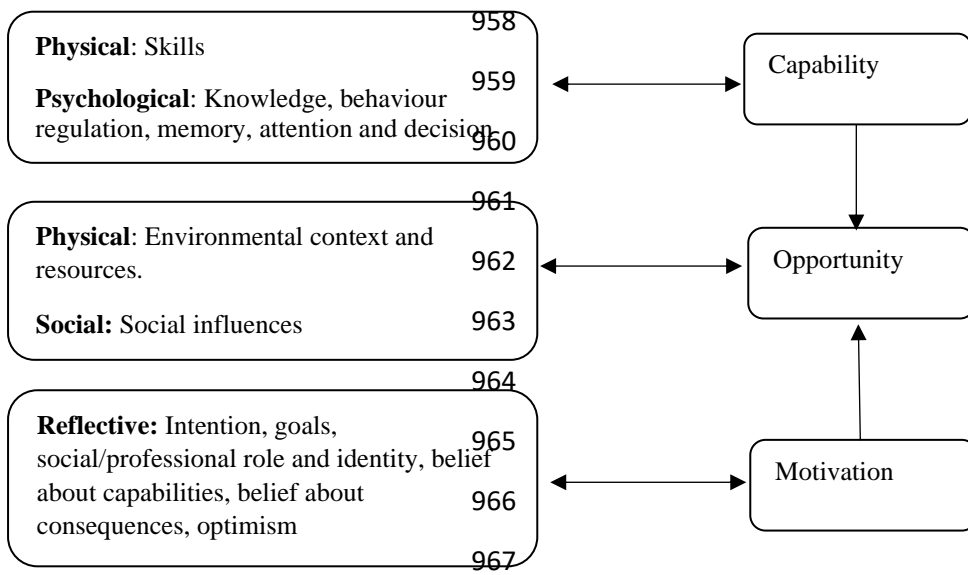
953 COM-B: Capability, Opportunity, Motivation, Behaviour. TDF: Theoretical domains framework

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968 **Figure 1(a):** TDF domains and corresponding mapping onto the COM-B component

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