

1 **TITLE**

2 A qualitative exploration of the shift work experience: the perceived barriers and facilitators
3 to a healthier lifestyle and the role of the workplace environment.

4

5 **ABSTRACT**

6 *Objectives:* The study aimed to understand lifestyle practices among shift workers, including
7 an exploration of workers' perceptions of their workplace environment (WPE).

8 *Methods:* Fifteen focus groups (FGs) were conducted by two researchers, with a total of 109
9 participants. A pilot FG was carried out with both researchers present, to ensure consistency
10 in facilitation. To ensure quality control, both researchers analysed all data collected.

11 *Results:* Two overarching themes were observed; barriers to leading a healthier lifestyle, and
12 facilitators to leading a healthier lifestyle. The influence of WPE was central to both themes.

13 *Conclusions:* Investing in employee health is beneficial, particularly among shift workers,
14 who are at increased health risk. Adopting organisational policies and environmental changes
15 as a core strategy for workplace health promotion may create an environment which makes
16 healthier choices more accessible to all employees.

17

18 **INTRODUCTION**

19 The prevalence of shift work has increased in recent times, with approximately 17% of the
20 workforce in Europe engaged in this type of work pattern⁽¹⁾. Definitions of shift work vary in
21 the published scientific literature. In Europe, shift work is defined as “*any method of*
22 *organising work in shifts whereby workers succeed each other at the same work stations*
23 *according to a certain pattern, including a rotating pattern, and which may be continuous or*
24 *discontinuous, entailing the need for workers to work at different times over a given period of*
25 *days or weeks*”^(2, 3). This typically entails working hours outside of the standard working
26 week, and may involve evening, weekend and rotating shift patterns. Shift work is prevalent
27 across a wide range of occupational sectors; and is necessary for 24-hr services such as
28 emergency, security and utility services, production lines, leisure and entertainment industries
29 and sectors which require work across different time zones⁽⁴⁾.

30 Unfortunately, these atypical working hours often lead to disturbances in workers' daily
31 routine, namely disruption to internal circadian rhythms. The circadian system regulates the
32 timing of daily variations in numerous behavioural, endocrine and neurophysiological
33 processes over 24 hours⁽⁵⁾, for example, sleep-wake cycles, metabolism, blood pressure and
34 the release of hormones. This approximate 24 hour biological rhythm is generated by the
35 suprachiasmatic nucleus, which is located in the anterior hypothalamus of the brain⁽⁶⁾. Almost
36 all bodily functions, from those at cellular level to large physiological systems, are circadian
37 rhythmic and disruption to these key rhythms may have negative implications for health.
38 Shift workers, therefore, have been reported to be at higher risk of cancers⁽⁷⁻¹¹⁾, particularly
39 breast and colorectal cancer; metabolic syndrome⁽¹²⁻¹⁶⁾, type 2 diabetes mellitus^(17, 18),
40 cardiovascular diseases⁽¹⁹⁻²¹⁾ and gastrointestinal disorders⁽²²⁾ compared to those working
41 typical hours. Shift work has also been associated with a poorer quality of life and increased
42 mental health issues, such as anxiety disorders and depressive symptoms^(23, 24).

43 It has been postulated that such higher disease risk in shift workers may be contributed to by
44 altered lifestyle behaviours, brought about by these atypical and erratic working patterns.
45 Shift workers have been reported to have poorer quality diets^(14, 25-27) and irregular eating
46 patterns^(14, 28-30) compared to day workers. Shift work has also been associated with increased
47 alcohol consumption⁽³¹⁻³³⁾ and higher rates of smoking⁽³⁴⁻³⁷⁾. There have been mixed reports
48 on the effect of shift work on physical activity, with both positive and negative effects being
49 reported⁽³⁸⁾. Barriers to a healthier lifestyle exist for all individuals, and for some this can be
50 heavily influenced by features of the modern obesogenic environment. The increased
51 availability of energy dense processed foods, excessive portion sizes, unhelpful media and
52 advertising practices, and social norms and cues surrounding eating may create obstacles to
53 eating more healthily. Moreover, our increasingly automated society promotes a sedentary
54 lifestyle which can substantially decrease the opportunity for physical activity. It is likely,
55 based on current evidence on lifestyle practices among this group⁽³⁸⁾, that shift workers may
56 face additional barriers to a healthier lifestyle.

57 It is not just the pattern of work which may influence the health of shift workers; the
58 workplace environment (WPE) itself may play a key role in facilitating or preventing better
59 dietary and lifestyle choices. It has been estimated that most adults in employment spend
60 approximately 60% of their waking hours at work⁽³⁹⁾. Therefore, the WPE has the potential to
61 have a strong influence on health, and employers thus have the opportunity to create a work
62 culture that promotes health, and improves the well-being of their workforce. Workplace

63 health initiatives (e.g. physical activity groups, smoking cessation) and careful management
64 of shift work routines and patterns by employers can help minimise the deleterious effects of
65 shift work on the body and promote workers' health and wellbeing. Employers stand to gain
66 from investing in the health of their employees, as costs are minimised by decreasing
67 sickness and absence, staff turnover, and the numbers of errors and associated costs, as well
68 as having a more productive workforce⁽⁴⁾ and potentially increasing staff moral.

69 To date, little research has been published with regard to improving modifiable lifestyle risk
70 factors in shift workers and this behavioural change could play an important part in
71 addressing some of the health risks associated with shift work. A lack of data on the barriers
72 and facilitators experienced by shift workers when trying to lead a healthier lifestyle is a large
73 obstacle in helping improve the health behaviours of this group. A deeper exploration of such
74 factors influencing shift workers' ability to lead a healthier lifestyle will provide data that
75 could be beneficial for such endeavours.

76

77 **AIM**

78 This qualitative study aimed to identify and gain a meaningful understanding of the barriers
79 and facilitators to healthy lifestyle practices experienced by shift workers on the island of
80 Ireland, including an exploration of workers' opinions on their WPE.

81

82 **METHODOLOGY**

83 *Study Design*

84 A qualitative approach in the form of focus groups (FGs) was used to gain an understanding
85 of the issues faced by shift workers in relation to their lifestyle practices. Semi-structured
86 focus groups were used to facilitate the identification of unforeseen or overlooked issues
87 while allowing flexibility of discussion. Fifteen FGs were conducted across the island of
88 Ireland, with a total of 109 participants. FGs ranged in size from 5-12 participants (mean of
89 7) per group. Nine FGs took place in the Republic of Ireland (ROI) and six in Northern
90 Ireland (NI). FGs in ROI and NI were carried out by two separate researchers. A pilot FG
91 was carried out with both researchers present in order to ensure consistency in FG

92 facilitation. To ensure quality control, both researchers analysed all data collected in each
93 jurisdiction.

94 *Ethical considerations*

95 Ethical approval for this research was received from the Ethics Committee at the Dublin
96 Institute of Technology (DIT), Ireland; the application and approval from the DIT was
97 reviewed and agreed to by the Ulster University Research Ethics Committee. All participants
98 were provided with a study information sheet prior to participating. A verbal explanation of
99 the study was also given at the start of each FG, and participants had the opportunity to ask
100 questions or to withdraw from the study. Prior to commencing each FG, written informed
101 consent was given by each participant.

102 *Recruitment of participants*

103 Participants were identified and recruited based on sector of employment and location. The
104 three largest sectors employing shift workers on the island of Ireland were targeted; the
105 accommodation and food services (AFS) sector (n=5 FGs), the health and social care (HSC)
106 sector (n=6 FGs) and the manufacturing/industry (M/I) sector (n=4 FGs). Efforts were made
107 while recruiting to ensure the overall sample was broadly representative of rural/urban
108 locations, gender, age and public/private sector employment. Each group was comprised of
109 employees (M/F; 18+ years old) from the same organisation. Contact was made with a
110 designated person of authority at each organisation, who disseminated information on the
111 study to employees. Participants were offered a gift voucher valued at £15/€20 as a
112 discretionary honorarium for taking part.

113 *Focus group discussion guide*

114 Discussion points for the FGs were developed based on gaps in the published scientific
115 literature identified during an extensive literature review⁽³⁸⁾. The draft discussion guide was
116 piloted among a group of HSC workers in ROI (n=6). Minor adjustments, including refining
117 and reordering of questions, were made to the discussion points and the data gathered for the
118 pilot study were deemed to be of high enough quality to be included in analysis of the study
119 findings. The finalised discussion guide allowed room for broader discussion of issues of
120 particular importance to each group as they arose.

121 *Data collection and analysis*

122 FGs took place on site in the workplace in a quiet space (e.g. a meeting room). FG
123 discussions were recorded using a digital dictaphone, and each lasted between 40 and 70
124 minutes. Participants' demographic and household characteristics were obtained via a
125 questionnaire prior to commencing the group discussion. FG recordings were professionally
126 transcribed verbatim and individual/company names removed to protect anonymity. The
127 transcripts were reviewed and compared to FG recordings to ensure accuracy and to
128 encourage familiarity with the data. Transcripts were imported into, the qualitative data
129 analysis software package, NVivo 10(40). An inductive thematic analysis procedure, as
130 outlined by Braun and Clarke(41), was applied to the data in order to identify common
131 themes. Initially, transcripts were read repeatedly in order to achieve data 'immersion' and
132 generate initial ideas about trends within the data. Two researchers independently and
133 systematically coded the transcripts and discussed the codes to verify the validity and
134 reliability of their application to the data. Overarching themes and subthemes were then
135 identified. Both researchers reached a consensus on the assignment of all themes (inter-rater
136 reliability was therefore equal to 1.00 as there was full agreement) and extracted quotations to
137 illustrate typical views.

138

139 **RESULTS**

140 The demographic profile of the 109 participants is presented in **Table 1**. The sample
141 population was composed of 65 males and 44 females, and fell within the 18-64 years age
142 range. The majority (80%) of participants were from the island of Ireland. Almost half (48%)
143 were categorised as overweight or obese (based on self-reported height and weight), while
144 30% were physically active just once a week or less. Two overarching themes were observed
145 across the FG discussions; the barriers to leading a healthier lifestyle, and the facilitators to
146 leading a healthier lifestyle. The influence of the WPE was central to both themes.

147

148 Theme 1 – Barriers to leading a healthier lifestyle

149 Discussions of the barriers to healthy living concentrated largely on disrupted routine,
150 tiredness, time management, and issues within the WPE. Workers' lifestyle behaviours were
151 affected both during working and outside of working hours, and it was evident that shift work
152 had a wide ranging effect on workers' lives. Barriers specific to each of the work sectors

153 included in the study were also noted. Foremost, a lack of a consistent routine and erratic
154 work schedules were perceived as one of the most difficult aspects of shift work and
155 appeared to have a negative effect on lifestyle behaviours.

156 *“Your routine is completely gone and you’re not on night duty for long*
157 *enough to adjust in one way (...) so you tend to not eat very well...”* (HSC
158 worker)

159 *“...what helps to reinforce an exercise regime is if it’s consistent and regular,*
160 *but with shift work you don’t really have... that opportunity because your shift*
161 *pattern is changing, so therefore that exercise isn’t regular.”* (AFS worker)

162 *“...if you’re on a 9 to 5 the whole time you know exactly what’s set out week*
163 *from week ahead of you, you can plan so far ahead. But then in this shift you*
164 *could be, every week it’s kind of different...you’re less likely to plan further*
165 *ahead and then that’s why you say oh I couldn’t be bothered”* (AFS worker)

166 *“...most of us are not getting home when you should be getting home. So you*
167 *can’t even plan to say I’ll do the shopping on the way home, the shops are*
168 *closed by the time your, if you’re not living in a major town.”* (HSC worker)

169 Across all groups, tiredness was quoted as a major barrier for workers to make healthier
170 lifestyle choices, often leading to a lack of motivation or will power. This physical and
171 mental tiredness, and the resulting lack of motivation were often related to the intensity of
172 workload and the effect shift work has on sleep quality and quantity.

173 *“...when I go home from shift work I’m too tired I wouldn’t be bothered*
174 *cooking. So I just go to the supermarket on the way home and get a roll or*
175 *chicken wrap or something.”* (HSC worker)

176 *“You don’t have the inclination either coming off a long shift, you really have*
177 *to make the effort.”* (HSC worker)

178 Many also recalled difficulties with time management, with workers experiencing time
179 pressures both within the workplace and at home.

180 *“...you come in at twelve noon and you finish at eleven, and then you’re lucky*
181 *to get maybe half an hour, if you’re lucky”;* *“You get a toilet break if you’re*

182 *lucky*"; *"If you're lucky, yeah. We have situations where you don't get time,*
183 *you just don't, we're just flat out all day"* (AFS workers)

184 *"I think the day is just so long, when you're doing a long day shift, 12 hours,*
185 *you have the bones of an hour to an hour and a half to travel in and out to*
186 *work, meal plans will not exist"* (HSC worker)

187 *"So essentially, so we can't really do our administrative roles and you know*
188 *duties that we have to do after work and housework and washing the clothes is*
189 *left behind and things like that, so definitely it does, you know prioritise your*
190 *sleep and just conserve energy"* (HSC worker)

191 *"...it's hard to have a social life never mind even thinking about cooking.*
192 *When am I going to see my friends, when am I going to see my daughter..."*
193 (AFS worker)

194 When faced with a lack of time, workers more often than not turned to convenience foods,
195 with unhealthy, processed food more likely to be consumed.

196 *"...you're coming home late in the evening sometimes it's easier just to eat*
197 *something that takes not very much time to cook, which is usually not very*
198 *healthy"* (HSC worker)

199 *"During the week you're getting a take away or you're doing things that are*
200 *easy and quick"* (HSC worker)

201 During discussions, it became evident that features of the WPE itself created difficulty in
202 leading a healthier lifestyle and in particular eating healthily. In some instances, simply the
203 availability of unhealthy or processed foods and the lack of healthy choices were barriers to
204 healthy eating. A lack of canteen facilities, particularly at nights and weekends created an
205 additional barrier to healthy eating, and in these circumstances takeaway foods were often the
206 only option. In addition, many expressed disappointment at inadequate facilities for storing
207 or preparing food brought in from home.

208 *"If you're on night duty we have no canteen, or no area where you can get hot*
209 *food. If you're on weekends, again the canteen is closed."* (HSC worker)

210 *“The only thing that seems to be access at night is these bloody vending*
211 *machines. There’s not the sight of bit of an apple or an orange or anything like*
212 *that.”* (HSC worker)

213 *“..there’s fridges there but we’re not allowed put our food in there... So*
214 *there’s not really facilities.”* (HSC worker)

215 A demanding environment with a lack of breaks and heavy workload was an issue raised by
216 many workers, particularly those in the HSC and AFS sectors. Unfortunately for some, an
217 organisational culture of *“how things are done around here”* existed, which left them feeling
218 helpless and unable to advocate for improved working conditions.

219 *“No one cares if you don’t get a break or if you have to work”* (HSC worker)

220 *“...it’s never going to change unless we say something, like literally it’s like*
221 *‘well I trained like that, why can’t you survive with no break’”* (HSC worker)

222 Based on comparisons between groups, it was evident that work sectors differed in terms of
223 factors which may help or hinder employees in their efforts to lead a healthy lifestyle. It was
224 observed that HSC workers appeared to have the poorest WPE, with high on the job demands
225 and a stressful working environment. This WPE typically did not lend itself to healthy dietary
226 choices, with a lack of facilities for purchasing, storing or preparing food, and insufficient
227 breaks due to a high workload and staff shortages. Keeping hydrated was also highlighted as
228 an issue among this group, with some avoiding drinking fluid as taking bathroom breaks was
229 difficult. Many workers from this sector expressed frustration at the irony of working in a
230 setting which promotes health, whilst being unable to tend to their own health needs in terms
231 of their diet and lifestyle.

232 *“I suppose as health professionals we’re very much aware of the effects of bad*
233 *eating. And we’re advocating healthy eating for our own patients and to the*
234 *extent that we’re advocating protected meal times for our patients where*
235 *they’re not disturbed during meal time. And yet we as health professionals and*
236 *workers never get a protected meal time and very rarely have time to sit*
237 *properly as you normally would do”* (HSC worker)

238 The effect of shift work on their health was a frequent concern among workers from this
239 group. Similarly, the WPE has a strong influence on health behaviours for those in the AFS

240 sector. The majority in this sector had their meals provided free of charge in the workplace,
241 with varying degrees of quality. Despite this, many still opted for unhealthy processed foods
242 or takeaways. Some within this sector also had free or discounted access to gym facilities on
243 site, which many found useful when trying to make lifestyle improvements. The main
244 occupational barrier to a healthier diet perceived by AFS workers was on the job “*picking*” at
245 food throughout the day, with easy access to food at all times.

246 *“You pick up lots of bad habits in hotels and in bars and restaurants...like I*
247 *found that when I worked in food and beverage, like if there’s something in*
248 *front of you, like croissants or whatever, you do sort of like go oh my break is*
249 *not for another hour, I’ll have a coffee and a croissant.”* (AFS worker)

250 *“You get quick chips or running through the kitchen, just take a chip on the*
251 *way, you know 100 a day”;* *“So much pick, like you just walk past, you pick up*
252 *like piece of bread or bread roll, really unhealthy, it’s not a piece of fruit you*
253 *pick up.”* (AFS workers)

254 Workers in this sector also recognised that a lack of canteen facilities at night time created
255 difficulty when trying to eat healthily. Similar to those in the HSC sector, on the job demands
256 and insufficient breaks were an issue. When the moderator enquired specifically about
257 alcohol consumption, workers acknowledged that increased consumption of alcohol was
258 common due to the nature of working in the services sector, and the ready availability of
259 alcohol in the WPE.

260 *“To be really honest, like hospitality is quite a sociable industry, you know,*
261 *and we...because we were working in the bars, you know, we would do quite a*
262 *lot of drinking”* (AFS worker)

263 Groups from the MI sector appeared to have a somewhat healthier WPE, and for the most
264 part reported having reliable break times and a WPE that was more conducive to a healthy
265 lifestyle. Groups from this sector reported the positive sides of shift work more often than
266 those from other sectors, and workplace-related factors were less often mentioned as barriers
267 to leading a healthier lifestyle. Some groups described the availability of unhealthy foods
268 within the WPE as a barrier, such as vending machines or fried foods in the canteen.

269 *“Yeah, there’s temptation around every corner, you know what I mean. The*
270 *canteen we have is, it’s really just a sweet shop up there”* (MI worker)

271 As a result, many reported bringing their own food from home. Issues related to disrupted
272 routine and tiredness because of the specific shift patterns appeared to be the main barriers
273 among groups from this sector.

274 On the whole, those with a less healthful WPE often expressed feeling low levels of control
275 over their lifestyle choices. They frequently cited external factors as having more control over
276 their lifestyle and health than their own choices, often identifying shift work and the WPE as
277 being a strong factor in their inability to improve their diet and lifestyle. Examples were
278 provided where efforts were made to improve their diet or lifestyle only to have these efforts
279 hampered by elements of the job or the WPE, leading to feelings of powerlessness.

280 [in reference to a disturbed meal break]

281 *“...and then what happens is that’s when the bad food comes in then because*
282 *the stuff you’ve brought in all nice is spoilt, so then it’s like, sod this and then*
283 *you’re down to the chip shop (...) you find because you just know the way the*
284 *day is going it’s busy, you’ve just got your food spoilt and that’s like, well*
285 *that’s it really isn’t it, so any plans you had to try and keep healthy that day is*
286 *out the window.”* (HSC worker)

287 Feeling undervalued by their employer, along with stress and a poor WPE meant that for
288 many, morale was very low within the workplace, which in turn affects motivation levels
289 both within and outside of work.

290 *“...fall off the seat if they came in with something, you know, an initiative to*
291 *keep us right, I mean we just wouldn’t believe it”* (HSC worker)

292 *“We don’t get paid half enough for what we do”;* *“And I think stress now at*
293 *work really is adding to, you know particularly when people are working a*
294 *long day and some staff would work 2 long days and maybe even 3 long days*
295 *together”;* *“That’s hugely stressful if you’re working and you’re not eating*
296 *properly and you’re very tired”* (HSC workers)

297 This stress and lack of morale often manifested as apathy towards making lifestyle
298 improvements and a defeatist outlook with a “*why bother*” attitude.

299

300 Theme 2 – Facilitators to leading a healthier lifestyle

301 Discussions of barriers to healthier living typically lead to workers to express their opinions
302 on factors which could facilitate healthier living; however, in some instances prompting was
303 required in order to move discussions towards more positive dialogue. Broadly speaking, the
304 opportunities for facilitating a healthier lifestyle reported during the discussions were either:
305 1) areas that the employer or workplace could improve on; or 2) solutions for individuals
306 themselves.

307

308 Employer/workplace

309 It was evident from discussions that the WPE can be a strong influence on lifestyle
310 behaviours. Many of the aforementioned barriers were mirrored in discussions of facilitators,
311 with suggestions and ideas from workers as to how employers might improve factors and
312 facilities within the workplace making it more conducive to a healthier lifestyle.

313 *“I think as an employer to have people doing shift work through the night, they*
314 *have to be obliged to provide food for people. Now I’m not saying pay for it*
315 *but it has to be available” (HSC worker)*

316 *“They supply fridges too for keeping all your lunches chilled and stuff” (M/I*
317 *worker)*

318 *“And it’s all about the choice you have if you have stuff like that you go, ‘Oh I*
319 *wouldn’t mind a bit of fruit today’ or if it’s just a fry you go, ‘Well I’m going to*
320 *have to’”; “Yes, better quality and more choice” (HSC workers)*

321 *“Just for argument sake, if there was a gym here within the plant we’ll say, at*
322 *night time you’d see a lot of fellas going to that rather than going to eat” (M/I*
323 *worker)*

324 The availability of food within the workplace including outside of regular daytime working
325 hours was frequently highlighted across most groups as an important opportunity for
326 improving dietary choices, on the condition that healthy dining and snack options were
327 available.

328 *“it’s also availability really of healthy food because I can’t go to the kitchen*
329 *and go you know oh I want salad, this and that and no sauce and blah, blah,*
330 *blah” (AFS worker)*

331 *“...the vending machine upstairs, the Coke machine and there’s a sweet*
332 *machine. Like in a work place they shouldn’t be there” (M/I worker)*

333 In addition, many workers, particularly those in the HSC and AFS groups, highlighted the
334 importance of *“protected times to be able to eat”* with adequate cover, in order to prevent
335 being called back to work early thus allowing sufficient time to eat and to help improve
336 overall meal patterns.

337 The topic of workplace health initiatives was raised by some groups, with some employers
338 and larger organisations already being particularly proactive in this area, while others had
339 experience of such initiatives in previous employment. It was evident that where workplace
340 health initiatives were available, they were generally well received by workers. For those
341 workers who had no direct experience of such initiatives they were, on the whole, receptive
342 to the idea.

343 *“We actually had... do you know the TV programme, the Biggest Loser... we*
344 *actually did that with the staff... and we actually got people on there with their*
345 *weekly weigh ins and things like this, so yeah that was good fun actually.”*
346 *(AFS worker)*

347 *“...as I got older, I started feeling a bit worse maybe and put on a bit of*
348 *weight, and then it coincided with them here, the [workplace health initiative]*
349 *and this and that. They were giving you more information about your diet and*
350 *about exercise and then once I got kicked on that, I started feeling better,*
351 *started managing better.” (M/I worker)*

352 It was apparent that when a WPE was supportive of a healthier lifestyle and promoted health
353 more often, it was perceived by some that improvements in lifestyle behaviours were simply
354 down to personal choice.

355 *“It’s up to everybody to control their own shift pattern themselves. You just*
356 *can’t blame the shift pattern. You’re in control of it, you should look after*
357 *yourself” (MI worker)*

358 Those in a WPE that had a more positive culture and attitude towards health appeared more
359 empowered in their lifestyle choices and less often cited shift work or issues within the WPE
360 as barriers to a healthier lifestyle. The positive effect of investing in staff welfare was evident
361 from some groups, and it was clear that feeling valued by their employer encouraged
362 employees to value their own health too.

363 *“I think the last three or four years they [the employer] really have upped their*
364 *game regarding us. They realise that we’re a resource and helping us how to*
365 *feel better. I think that generally there’s more education..., ...so they’re taking*
366 *a proactive approach to it, and it’s noticeable”* (MI worker)

367

368 Individuals

369 Advice, specifically tailored for shift workers was welcomed by the majority of workers, with
370 the caveat that this was consistent, practical and achievable – and invested in by the
371 employer.

372 *“it’s alright getting the information but what you would have to do is get the*
373 *company to buy into it because unless the company buys into it there’s no point*
374 *handing out leaflets, you know, they would have to be actioned rather than just*
375 *having the theory”* (AFS worker)

376 Particular areas of interest included education on time management, meal planning,
377 optimising sleep patterns and information on the risks associated with shift work. Suggested
378 media for communicating advice included a local intranet site, monthly newsletters or
379 posters, and apps and/or social media which would allow workers access information at a
380 time that is convenient to them. It was also noted that this might be particularly useful for
381 younger people when just starting shift work, trying to adjust for the first time to disrupted
382 lifestyle routines after many years of structured education, for example.

383 Other ideas volunteered included ways to increase organisation and planning around grocery
384 shopping, meal planning and meal preparation in order to help facilitate a healthy diet, and it
385 was suggested that this improved time management could help reduce stress and reliance on
386 convenience foods.

387 “Cook once a week, normally is what I do is on a Monday, I cook and freeze
388 for the week. So you have all your lunches for the week, just take out whatever
389 you fancy out of the freezer like, you know, so you’ve some basic plan.” (M/I
390 worker)

391 “...if you’re hungry at 2 o’clock and you didn’t go to the trouble of getting
392 your own lunch, you’re going to go for something that’s the wrong food.” (M/I
393 workers)

394 Others felt that bringing their own meals from home into work “because you know exactly
395 what you’re making”, helped to ensure that they had more control over their dietary choices.

396 “Most people if they’re eating better, eating well, bring their own. That’s
397 basically the bottom line, rather than relying on the canteen cooking something
398 healthy, you bring your healthy stuff when you want to eat something more
399 healthy” (M/I worker)

400 When prompted, workers also discussed the motivators for improving their diet and lifestyle.
401 For some, intrinsic health concerns such as weight gain, body image and “how you feel in
402 yourself” motivated them to improve their lifestyle. The enjoyment of eating well and
403 exercising motivated some people, along with the effect of improving mood. Some concede
404 that “it’s very hard to do it by yourself” and so the actions of those around them appeared to
405 have an effect, motivating them to improve their own lifestyle practices.

406 It was also noteworthy that individual differences in tolerance of shift work were apparent in
407 the FGs, irrespective of the WPE. There was a general consensus among the groups that
408 despite the barriers and facilitators stated by participants, it was easy to “blame shift work”
409 for making poorer choices.

410 “...sometimes say ah sure it’s ok I’m on nights, I can have one, let myself go
411 like” (MI worker)

412 “Even on the way home though like from the shift, like I pass the shop and I
413 have to go in and get something for myself, because I feel sorry for myself, I
414 deserve it” (HSC worker)

415 Justifying poor lifestyle choices due to shift work was mentioned by some. This highlighted
416 the importance and role of individual intrinsic factors such as motivation to improve lifestyle.

417 *“I think you need to keep yourself motivated because...if that’s gone, you*
418 *know, then you can blame everything by work. You know, it sounds very bad*
419 *that we all say, you know, “My shift, this, that, the other,” but...”*; *“You have*
420 *to motivate yourself”* (AFS workers)

421 It was believed by many that it is possible to make time for a healthy diet and an active
422 lifestyle through being organised, planning ahead and managing time appropriately.

423

424 **DISCUSSION**

425 The present study provides a novel qualitative aspect to the investigation of lifestyle
426 behaviours and workplace health across a range of shift workers, and identified the many
427 barriers that can exist which may prevent shift workers leading a healthier lifestyle. The rich
428 qualitative data revealed that shift work impacts on most aspects of workers’ lives and not
429 solely on days when shift work is carried out. Discussion of these barriers also highlighted
430 opportunities or facilitators to healthier living, such as actions which both the employer and
431 individual employee may take. In addition, discussions revealed the influence which the WPE
432 itself can have on workers’ ability to lead a healthier lifestyle, with the culture within the
433 workplace appearing to influence workers’ perceptions of the control they have over their
434 lifestyle choices. The present study also indicated that shift workers are receptive to the idea
435 of workplace health promotion (WPHP), and this is a key avenue which should be explored
436 by employers.

437 Feelings of disorientation and being *“under pressure”* were a strong undercurrent during
438 discussions of barriers to a healthy lifestyle. A constantly changing routine, frequently altered
439 shift schedules and long shifts impeded workers from staying on top of their day to day
440 activities and commitments. This manifested itself in difficulty planning and preparing meals,
441 doing supermarket shopping during opening hours, or engaging in regular physical activity. It
442 was evident that the difficulty balancing daily activities outside of working hours such as
443 sleeping, eating, commuting and exercising was a major frustration for many. This disrupted
444 routine and intense time pressure also impacts on workers’ abilities to maintain relationships
445 with family and friends, as well as maintain a household. Healthy eating and physical
446 activity, therefore, became lower priorities to essential tasks and commitments such as
447 sleeping and family time. Such pressure was also experienced within the workplace with an

448 intense workload, insufficient breaks and high work-related stress, particularly among the
449 HSC sector. The present study clearly reflects the extent to which the WPE may impact on
450 workers' abilities to lead a healthy lifestyle; with differences observed between employment
451 sectors. Observations surrounding negative workplace health culture and the subsequent
452 effect of this on workers' locus of control over their own lifestyle and the value which they
453 place on their health were also clearly apparent.

454 Many of the identified barriers in the present study concur with those reported in similar
455 previous studies, with the most commonly cited perceived barriers relating to the WPE and
456 related facilities, such as a lack of breaks, unfavourable shift patterns, poor food selection,
457 canteen opening times and work-related stress⁽⁴²⁻⁴⁵⁾. Issues highlighted in the present study
458 which relate to shift work in general, such as tiredness, a lack of time or routine and the
459 subsequent effect of this on meal planning and use of convenience foods, echoes those
460 reported by Phiri *et al.* in their qualitative study of nurses⁽⁴⁵⁾. Intrinsic factors, such as a lack
461 of motivation to lead a healthier lifestyle were identified in the present study, illustrating that
462 some of the reported poorer lifestyle choices among shift workers may be independent of
463 work pattern. Such factors have previously been described, specifically a lack of knowledge
464 surrounding healthy eating⁽⁴²⁾. Addressing such issues requires specialist competence in
465 behavioural change in order to empower and provide shift workers with the skills to
466 implement lifestyle change.

467 It was encouraging in the current study that workers appeared to be receptive to WPHP, as
468 well as improved eating and exercise facilities as facilitators to help them make healthier
469 choices within the workplace. Ideas for WPHP included information on diet and physical
470 activity, regular health checks, subsidised canteens or exercise facilities, or organised group
471 activities within the workplace. In particular, the use of mobile apps and social media was
472 highlighted as a potential method for promoting health, particularly amongst younger
473 workers. Those who had encountered WPHP were satisfied with their experience and it was
474 clear that WPHP was successful in boosting morale amongst staff. On the other hand, in such
475 discussions of WPHP, it became apparent that many from less positive WPE's felt
476 undervalued by their employer. Without the employer fully engaging with the idea of
477 investing in their staffs' health, workers found it difficult to prioritise their own health. This
478 belief of a lack of support from the WPE perpetuated the lack of intrinsic motivation in such
479 individuals, complicating the situation further. Many subsequently had become disengaged
480 and disillusioned. In contrast, those who felt valued and invested in by their employer were

481 observed to have greater job satisfaction, confidence and sense of control over their lifestyle.
482 This demonstrates the powerful effect of workplace culture on both physical and mental
483 health.

484 The importance of WPHP has been acknowledged by the World Health Organization
485 (WHO). The WHO defines health promotion as “*the process of enabling people to increase*
486 *control over, and to improve, their health*”⁽⁴⁶⁾, and the WHO Ottawa Charter for Health
487 Promotion states “*work and leisure should be a source of health for people. The way society*
488 *organizes work should help create a healthy society*”⁽⁴⁷⁾. WPHP initiatives specifically
489 among shift workers have previously been explored; however, well-designed intervention
490 studies are lacking, leading to lack of clarity on their effectiveness compared with day
491 workers. Nonetheless, recent evidence suggests that when WPHP is available to them, shift
492 workers do not differ significantly from day workers with regard to participation⁽⁴⁸⁾. A critical
493 review of health related interventions among shift workers reported that while shift
494 scheduling has in some cases been shown to improve lifestyle behaviours, this alone is not
495 enough and interventions targeted specifically at improving lifestyle behaviours are
496 necessary⁽⁴⁹⁾. This highlights the importance and relevance of the present study in identifying
497 how barriers to improved lifestyle behaviours may be addressed. The success of WPHP
498 initiatives among shift workers indicates that targeted physical activity programmes improve
499 cardiorespiratory fitness and strength^(50, 51) and that targeted workplace weight loss
500 programmes significantly improve anthropometrical measurements, blood pressure and
501 physical activity levels^(39, 52). Taking their evaluation one step further, one workplace-based
502 weight loss programme also reported significant improvements on work-based outcomes, for
503 example, having a positive effect on quality of life, productivity at work, and absenteeism⁽⁵²⁾.
504 These observations from previous studies and supported by the present study provide
505 evidence in favour of WPHP, supporting the WHO’s stance; it is in the employer’s best
506 interest to have a workforce which is happy and healthy.

507 While much of the discussions in the current study focused on what the employer could do to
508 better facilitate a healthy lifestyle, workers typically focused less on the responsibility of the
509 individual in enabling healthy changes, such as improved time-management, organisation and
510 planning. Differences were observed in individual intrinsic motivation to improve health and
511 cope with the demands of shift work, which has been previously described as the individual
512 tolerance to shift work⁽⁵³⁾, including a tendency towards an internal locus of control. Locus of
513 control has been explored specifically among shift workers^(53, 54). Shift work related

514 internality was associated in these studies with more positive outcomes in terms of sleep
515 issues, disruption to social and family life, improved subjective mental and physical health
516 and greater job satisfaction. This implies that those who tend towards having an internal locus
517 of control may cope better with the demands of shift work, which may account for some of
518 the observed individual differences in intrinsic motivation to improve health.

519

520 **CONCLUSION**

521 Investing in employee health is beneficial to the employer, particularly among a group such
522 as shift workers, who are at increased health risk. Employers should adopt organisational
523 policies and environmental changes as a core strategy for WPHP. Changes in practices and
524 alterations in the WPE, for example making healthier food choices available, providing
525 facilities for storing and preparing food, making it easier for employees to engage in physical
526 activity as part of their working day, ensuring sufficient breaks and supporting those who
527 wish to make healthier lifestyle choices, can influence and shape the workplace culture thus
528 creating an environment which makes the healthier choice more accessible to all employees.
529 In addition, improved shift scheduling would allow shift workers to plan and be more
530 organised outside of work, which may encourage healthier dietary and lifestyle choices by
531 enabling workers to better plan their meals and physical activity. In a cohort such as shift
532 workers where poor lifestyle choices may be common, these structural changes within the
533 WPE have the potential to greatly improve the health of a group which now makes up a
534 significant portion of the population and has the potential to achieve significant
535 improvements in public health.

536

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540

541 **CONFLICT OF INTEREST**

542 None

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547 **REFERENCES**

- 548 1. Eurofound. Fifth European Working Conditions Survey. Publications Office of the
549 European Union, Luxembourg.; 2012.
- 550 2. Council Directive 93/104/EC of 23 November 1993 concerning certain aspects of the
551 organization of working time, (13/12/1993).
- 552 3. Directive 2000/34/ EC of the European Parliament and of the Council of 22 June 2000
553 amending Council Directive 93/104/ EC concerning certain aspects of the organization of
554 working time to cover sectors and activities excluded from that Directive, (01/08/2000).
- 555 4. Health and Safety Authority. Guidance for Employers and Employees on Night and
556 Shift Work. Dublin, Ireland; September 2012.
- 557 5. Zhang X, Dube TJ, Esser KA. Working around the clock: circadian rhythms and
558 skeletal muscle. *J Appl Physiol* (1985). 2009;107(5):1647-54.
- 559 6. Schibler U, Sassone-Corsi P. A web of circadian pacemakers. *Cell*. 2002;111(7):919-
560 22.
- 561 7. International Agency for Research on Cancer. Painting, firefighting, and shiftwork.
562 IARC monographs on the evaluation of carcinogenic risks to humans / World Health
563 Organization, International Agency for Research on Cancer. 2010;98:9-764.
- 564 8. Megdal SP, Kroenke CH, Laden F, Pukkala E, Schernhammer ES. Night work and
565 breast cancer risk: a systematic review and meta-analysis. *European journal of cancer*
566 (Oxford, England : 1990). 2005;41(13):2023-32.
- 567 9. Wang F, Yeung KL, Chan WC, Kwok CC, Leung SL, Wu C, et al. A meta-analysis
568 on dose-response relationship between night shift work and the risk of breast cancer. *Annals*
569 *of oncology : official journal of the European Society for Medical Oncology / ESMO*.
570 2013;24(11):2724-32.
- 571 10. Kamdar BB, Tergas AI, Mateen FJ, Bhayani NH, Oh J. Night-shift work and risk of
572 breast cancer: a systematic review and meta-analysis. *Breast cancer research and treatment*.
573 2013;138(1):291-301.
- 574 11. Schernhammer ES, Laden F, Speizer FE, Willett WC, Hunter DJ, Kawachi I, et al.
575 Night-shift work and risk of colorectal cancer in the nurses' health study. *Journal of the*
576 *National Cancer Institute*. 2003;95(11):825-8.
- 577 12. Sookoian S, Gemma C, Fernandez Gianotti T, Burgueno A, Alvarez A, Gonzalez CD,
578 et al. Effects of rotating shift work on biomarkers of metabolic syndrome and inflammation.
579 *Journal of internal medicine*. 2007;261(3):285-92.
- 580 13. De Bacquer D, Van Risseghem M, Clays E, Kittel F, De Backer G, Braeckman L.
581 Rotating shift work and the metabolic syndrome: a prospective study. *International journal of*
582 *epidemiology*. 2009;38(3):848-54.
- 583 14. Esquirol Y, Bongard V, Mabile L, Jonnier B, Soulat JM, Perret B. Shift work and
584 metabolic syndrome: respective impacts of job strain, physical activity, and dietary rhythms.
585 *Chronobiol Int*. 2009;26(3):544-59.

- 586 15. Ye HH, Jeong JU, Jeon MJ, Sakong J. The Association between Shift Work and the
587 Metabolic Syndrome in Female Workers. *Annals of occupational and environmental*
588 *medicine*. 2013;25(1):33.
- 589 16. Wang F, Zhang L, Zhang Y, Zhang B, He Y, Xie S, et al. Meta-analysis on night shift
590 work and risk of metabolic syndrome. *Obesity reviews : an official journal of the*
591 *International Association for the Study of Obesity*. 2014.
- 592 17. Suwazono Y, Sakata K, Okubo Y, Harada H, Oishi M, Kobayashi E, et al. Long-term
593 longitudinal study on the relationship between alternating shift work and the onset of diabetes
594 mellitus in male Japanese workers. *Journal of occupational and environmental medicine /*
595 *American College of Occupational and Environmental Medicine*. 2006;48(5):455-61.
- 596 18. Pan A, Schernhammer ES, Sun Q, Hu FB. Rotating night shift work and risk of type 2
597 diabetes: two prospective cohort studies in women. *PLoS medicine*. 2011;8(12):e1001141.
- 598 19. Boggild H, Knutsson A. Shift work, risk factors and cardiovascular disease.
599 *Scandinavian journal of work, environment & health*. 1999;25(2):85-99.
- 600 20. Haupt CM, Alte D, Dorr M, Robinson DM, Felix SB, John U, et al. The relation of
601 exposure to shift work with atherosclerosis and myocardial infarction in a general population.
602 *Atherosclerosis*. 2008;201(1):205-11.
- 603 21. Brown DL, Feskanich D, Sanchez BN, Rexrode KM, Schernhammer ES, Lisabeth
604 LD. Rotating night shift work and the risk of ischemic stroke. *American journal of*
605 *epidemiology*. 2009;169(11):1370-7.
- 606 22. Knutsson A, Boggild H. Gastrointestinal disorders among shift workers. *Scandinavian*
607 *journal of work, environment & health*. 2010;36(2):85-95.
- 608 23. Scott AJ, Monk TH, Brink LL. Shiftwork as a Risk Factor for Depression: A Pilot
609 Study. *International journal of occupational and environmental health*. 1997;3(Supplement
610 2):S2-S9.
- 611 24. Driesen K, Jansen NW, van Amelsvoort LG, Kant I. The mutual relationship between
612 shift work and depressive complaints--a prospective cohort study. *Scandinavian journal of*
613 *work, environment & health*. 2011;37(5):402-10.
- 614 25. Nikolova N HS, Angelova K. Nutrition of night and shift workers in transports. In: G
615 C, editor. *Shiftwork: health, sleep and performance*. Frankfurt am Main (Germany): Peter
616 Lang; 1990. p. 583-7.
- 617 26. Linseisen J, Wolfram G. [Nutrient intake in permanent night shift workers]. *Z*
618 *Ernahrungswiss*. 1994;33(4):299-309.
- 619 27. Knutson A, Andersson H, Berglund U. Serum lipoproteins in day and shift workers: a
620 prospective study. *Br J Ind Med*. 1990;47(2):132-4.
- 621 28. Pasqua IC, Moreno CR. The nutritional status and eating habits of shift workers: a
622 chronobiological approach. *Chronobiol Int*. 2004;21(6):949-60.
- 623 29. de Assis MAA, Kupek E, Nahas MV, Bellisle F. Food intake and circadian rhythms in
624 shift workers with a high workload. *Appetite*. 2003;40(2):175-83.
- 625 30. Lennernas M, Hambræus L, Akerstedt T. Shift related dietary intake in day and shift
626 workers. *Appetite*. 1995;25(3):253-65.
- 627 31. Bushnell PT, Colombi A, Caruso CC, Tak S. Work schedules and health behavior
628 outcomes at a large manufacturer. *Ind Health*. 2010;48(4):395-405.
- 629 32. Morikawa Y, Sakurai M, Nakamura K, Nagasawa SY, Ishizaki M, Kido T, et al.
630 Correlation between shift-work-related sleep problems and heavy drinking in Japanese male
631 factory workers. *Alcohol Alcohol*. 2013;48(2):202-6.
- 632 33. Morikawa Y, Nakamura K, Sakurai M, Nagasawa SY, Ishizaki M, Nakashima M, et
633 al. The Effect of Age on the Relationships between Work-related Factors and Heavy
634 Drinking. *J Occup Health*. 2014;56(2):141-9.

- 635 34. van Amelsvoort LG, Schouten EG, Kok FJ. Impact of one year of shift work on
636 cardiovascular disease risk factors. *J Occup Environ Med.* 2004;46(7):699-706.
- 637 35. Cho YS, Kim HR, Myong JP, Kim HW. Association between work conditions and
638 smoking in South Korea. *Saf Health Work.* 2013;4(4):197-200.
- 639 36. Trinkoff AM, Storr CL. Work schedule characteristics and substance use in nurses.
640 *Am J Ind Med.* 1998;34(3):266-71.
- 641 37. Nabe-Nielsen K, Garde AH, Tuchsén F, Hogh A, Diderichsen F. Cardiovascular risk
642 factors and primary selection into shift work. *Scand J Work Environ Health.* 2008;34(3):206-
643 12.
- 644 38. Nea FM, Kearney J, Livingstone MB, Pourshahidi LK, Corish CA. Dietary and
645 lifestyle habits and the associated health risks in shift workers. *Nutr Res Rev.*
646 2015;28(2):143-66.
- 647 39. Morgan PJ, Collins CE, Plotnikoff RC, Cook AT, Berthon B, Mitchell S, et al.
648 Efficacy of a workplace-based weight loss program for overweight male shift workers: The
649 Workplace POWER (Preventing Obesity Without Eating like a Rabbit) randomized
650 controlled trial. *Preventive Medicine.* 2011;52(5):317-25.
- 651 40. Nvivo qualitative data analysis software. 10 ed: QSR International Pty Ltd.; 2012.
- 652 41. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in*
653 *Psychology.* 2006;3(2):77-101.
- 654 42. Faugier J, Lancaster J, Pickles D, Dobson K. Barriers to healthy eating in the nursing
655 profession: Part 1. *Nurs Stand.* 2001;15(36):33-6.
- 656 43. Faugier J, Lancaster J, Pickles D, Dobson K. Barriers to healthy eating in the nursing
657 profession: Part 2. *Nurs Stand.* 2001;15(37):33-5.
- 658 44. Winston J, Johnson C, Wilson S. Barriers to healthy eating by National Health
659 Service (NHS) hospital doctors in the hospital setting: results of a cross-sectional survey.
660 *BMC Res Notes.* 2008;1:69.
- 661 45. Phiri LP, Draper CE, Lambert EV, Kolbe-Alexander TL. Nurses' lifestyle behaviours,
662 health priorities and barriers to living a healthy lifestyle: a qualitative descriptive study. *BMC*
663 *Nurs.* 2014;13(1):38.
- 664 46. World Health Organization. Milestones in Health Promotion: Statements from Global
665 Conferences. 2009.
- 666 47. Ottawa charter for health promotion. *Can J Public Health.* 1986;77(6):425-30.
- 667 48. Nabe-Nielsen K, Garde AH, Clausen T, Jørgensen MB. Does workplace health
668 promotion reach shift workers? *Scand J Work Environ Health.* 2015;41(1):84-93.
- 669 49. Neil-Sztramko SE, Pahwa M, Demers PA, Gotay CC. Health-related interventions
670 among night shift workers: a critical review of the literature. *Scandinavian Journal of Work*
671 *Environment & Health.* 2014;40(6):543-56.
- 672 50. HÄRMÄ MI, Ilmarinen J, Knauth P, Rutenfranz J, HÄNNINEN O. Physical training
673 intervention in female shift workers: I. The effects of intervention on fitness, fatigue, sleep,
674 and psychosomatic symptoms. *Ergonomics.* 1988;31(1):39-50.
- 675 51. HÄRMÄ MI, Ilmarinen J, Knauth P, Rutenfranz J, HÄNNINEN O. Physical training
676 intervention in female shift workers: II. The effects of intervention on the circadian rhythms
677 of alertness, short-term memory, and body temperature. *Ergonomics.* 1988;31(1):51-63.
- 678 52. Morgan PJ, Collins CE, Plotnikoff RC, Cook AT, Berthon B, Mitchell S, et al. The
679 impact of a workplace-based weight loss program on work-related outcomes in overweight
680 male shift workers. *J Occup Environ Med.* 2012;54(2):122-7.
- 681 53. Smith L, Tanigawa T, Takahashi M, Mutou K, Tachibana N, Kage Y, et al. Shiftwork
682 locus of control, situational and behavioural effects on sleepiness and fatigue in shiftworkers.
683 *Ind Health.* 2005;43(1):151-70.

684 54. Smith L, Spelten E, Norman P. Shiftwork locus of control: Scale development. Work
685 & Stress. 1995;9(2-3):219-26.
686

Table 1. Demographic characteristics of focus group participants (n = 109)

Demographics	n= (%)	Demographics	n= (%)
Gender		Smoking status	
Male	65 (59.6)	Current smoker	17 (15.6)
Female	44 (40.4)	Ex-smoker	36 (33.0)
Age range		Never smoked	53 (48.6)
18-25	18 (16.5)	Unspecified	3 (2.8)
26-35	34 (31.2)	Frequency of physical activity	
36-45	25 (22.9)	<once per week	23 (21.1)
46-55	27 (24.8)	Once per week	10 (9.2)
56-64	4 (3.7)	2-3 times per week	39 (35.8)
Unspecified	1(0.9)	4-5 times per week	25 (22.9)
Nationality		≥6 times per week	8 (7.3)
Irish / Northern Irish	88 (80.7)	Unspecified	4 (3.7)
Other	20 (18.3)	Those who have made an attempt in the last year to:	
Unspecified	1 (0.9)	Lose weight	51 (48.1)
Marital Status		Eat less fat	61 (57.5)
Single	40 (36.7)	Eat more fruit and vegetables	70 (66.0)
Living with partner	13 (11.9)	Take more exercise	79 (74.5)
Married/civil partnership	52 (47.7)		
Divorced/separated	3 (2.8)		
Widowed	1 (0.9)		
Highest education level			
Secondary school to age 15/16	6 (5.5)		
Secondary school to age 17/18	14 (12.8)		
Additional training	35 (32.1)		
Undergraduate university	35 (32.1)		
Postgraduate university	19 (17.4)		
% with experience of types of shift work			
Day shift	39 (48.1)#		
Night shift	38 (47.5)#		
Rotating shift	56 (69.1)#		
Employed full time / part time			
Full time	94 (86.2)		
Part time	11 (10.1)		
Unspecified	4 (3.7)		
BMI (kg/m²)*			
<18.5 kg/m ²	1 (0.9)		
18.5 - 24.9 kg/m ²	43 (39.4)		
25.0 - 29.9 kg/m ²	38 (34.9)		
>30 kg/m ²	14 (12.8)		
Unspecified	13 (11.9)		

#A large proportion of participants did not answer this question (n=28) so results are presented as valid percentages

*BMI based on self-reported height and weight