

Short running title: Using focus groups and interviews to inform the design of a workplace exercise programme

1 Using focus groups and interviews to inform the design of a workplace exercise programme:
2 An example from a high-intensity interval training intervention

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19 exercise programme

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27 **Abstract**

28 **Objective:** Using a formative evaluation of a high-intensity interval training (HIIT)
29 intervention, we illustrate how qualitative data can inform the development of workplace
30 exercise interventions.

31 **Method:** Eight focus groups and four interviews were conducted with employees (n=38) and
32 management (n=4) from six office-based organisations before intervention implementation.

33 **Results:** Some participants thought workplace-based HIIT would be practical, given the
34 limited time required. Others perceived it may not be acceptable for all individuals, given the
35 exercise intensity. With consideration of identified barriers (workload /family commitments
36 effecting time availability) and facilitators (flexible working conditions) participants'
37 perspectives were incorporated into the intervention protocol. A short-term group-based
38 intervention was preferred, with a choice of exercise modes (based on stair climbing, stepping
39 or boxing).

40 **Conclusion:** This study provides a framework to incorporate stakeholders' perspectives into
41 the development of workplace exercise interventions.

42 **Keywords:** workplace; high-intensity interval training; formative evaluation; intervention
43 development; qualitative.

44

45 **1.0 Introduction**

46 Workplaces provide access for researchers to a considerable proportion of the adult population
47 (1) and have been identified as a priority setting for health promotion initiatives, such as
48 exercise interventions (2, 3). While workplace-based exercise interventions have been shown
49 to elicit meaningful adaptations in cardiorespiratory fitness (4), markers of cardiometabolic
50 health (5), and wellbeing (6), participation rates vary widely (10 to 64% of eligible employees
51 (7)) and loss to follow-up ranges from 4 to 40% (8). These factors may be explained by
52 intervention developers focusing on study design, intervention content (frequency, intensity,
53 time and type of exercise (9)) or statistical power and analysis (10), without giving due
54 consideration to the needs of the target study population. Inadequate consideration of the views
55 and requirements of key stakeholders can impact on the recruitment, implementation fidelity
56 and participant retention of the resultant intervention (11). One way of minimising these
57 potential issues is through formative evaluation conducted during the early development stage
58 of an intervention (12).

59
60 Formative evaluation is a systematic set of research activities, undertaken before an
61 intervention is implemented, to obtain detailed information about the people for whom, and the
62 context in which, interventions will be implemented (13). Formative evaluation can also be
63 used to enhance and refine preliminary intervention plans (14), which can facilitate an
64 understanding of the circumstances, needs and resources (e.g. workplace facilities for exercise
65 such as showers or space to exercise) of the target population, and assess the types of solutions
66 to barriers the target population would support (11). Various qualitative methods have been
67 used in previous formative evaluations of prospective health promotion programmes, including
68 telephone interviews, semi-structured face-to-face interviews and focus group discussions (14).
69 Although the use of quantitative methods (e.g., questionnaires) could permit the recruitment of

70 larger samples (15), this may be at the expense of the depth of information collected (11).
71 Furthermore, as part of the rationale for conducting formative evaluation is to build
72 relationships with key stakeholders and potential intervention participants, face-to-face focus
73 groups or interviews are considered a more appropriate data collection technique for this
74 purpose (11). Despite the documented usefulness of formative evaluation (11, 16), there are
75 surprisingly few examples of how qualitative formative evaluation can be used to inform the
76 design of exercise interventions. Of those available (e.g. 17, 18, 19), none have focused on
77 workplace exercise programmes.

78

79 Outside of formative evaluation work, employees' perspectives of workplace exercise have
80 been explored in various ways. In focus groups conducted with 42 hospital workers in the
81 United States, participants expressed an interest in a range of workplace exercise options
82 including walking groups, team-based competitions, exercise classes and access to personal
83 trainers (20). Commonly reported barriers included personal safety while exercising and
84 perceived lack of time (20). In a quantitative survey of 252 university employees in Australia,
85 respondents expressed preferences for personal training and group exercise classes, with lack
86 of time or motivation the most commonly cited barriers (21). While these studies are useful for
87 documenting potentially acceptable exercise modes for workplace programmes, they were not
88 conducted to inform the development of a specific workplace intervention *per se*. Rather, they
89 were standalone studies and thus do not provide explicit guidance or examples of how their
90 findings or the process undertaken could be used to tailor the design and implementation of a
91 future workplace programme.

92

93

94 Workplace exercise interventions have traditionally used moderate intensity aerobic and
95 resistance training exercise prescriptions (4) but recently the potential of conducting high-
96 intensity interval training (HIIT) in the workplace has begun to be explored (22-26). High-
97 intensity interval training is a form of exercise characterised by brief, intermittent bouts of
98 intense exercise, alternated with periods of rest or low-intensity active recovery (27), which
99 has shown promise for improving physical fitness and cardiometabolic health in both healthy
100 and diseased populations (28-30). While favourable adaptations in cardiorespiratory fitness,
101 cardiometabolic health and markers of mental wellbeing have been observed post-intervention
102 in the workplace (22-26), research into participant perceptions of delivering HIIT in the
103 workplace remains in its infancy.

104

105 To date only two workplace HIIT interventions have included a qualitative evaluation in their
106 overall programme design (22, 31). Nevertheless, in both instances, participants' insights were
107 sought solely after the intervention. How employees' perspectives could be incorporated into
108 the development and design of a proposed workplace HIIT intervention, therefore, remains
109 unknown. Accordingly, our aim was to demonstrate how qualitative data can inform the
110 development and implementation of a workplace exercise intervention. To illustrate this, we
111 have used focus group and one-to-one interview data from a formative evaluation of a proposed
112 workplace HIIT intervention, named Brief Exercise at Work (BE@Work). Herein, we aim to
113 provide a framework for the methods that can be undertaken to assist researchers and
114 practitioners to design bespoke workplace exercise interventions informed by key
115 stakeholders' perspectives.

116

117 **2.0 Materials and methods**

118 **2.1 BE@Work overview and proposed intervention**

119 The development and implementation of the BE@Work intervention was based on the Medical
120 Research Council framework for the development and evaluation of complex interventions
121 (16). The present study describes findings from the development stage; data from the
122 implementation of the BE@Work intervention will be published elsewhere (ClinicalTrials.gov
123 Identifier: NCT03467594). The MRC framework recommends formative research, involving
124 consultation with key stakeholders during intervention development, which can be undertaken
125 to explore perspectives of preliminary intervention plans (14).

126

127 The preliminary BE@Work intervention plan which we described to study participants, was
128 designed following a review of the scientific literature on HIIT. Specifically, the proposed
129 workplace intervention involved thrice-weekly, 20-30 minute supervised HIIT sessions, for a
130 duration of 6 to 10 weeks, based on the duration and frequency of previous workplace HIIT
131 interventions (23, 24). Proposed exercise modes (walking, jogging, running, skipping, non-
132 contact boxing [boxing herein], stair stepping, stair climbing and dance) were based on
133 activities used in previous HIIT or workplace exercise interventions which required minimal
134 equipment and/or could be modified to account for different fitness levels and exercise
135 experience (24, 32-35). However, the researchers explained to participants that the exercise
136 modes were merely examples, and exercise modes in the intervention could be based on
137 participant preference. They were also informed the proposed exercise programme would be
138 supervised by a member of our research team.

139

140 No single “best-practice” HIIT protocol has been identified (36) and although this could be
141 viewed as problematic when designing evidence based HIIT protocols; it could also be viewed

142 as an opportunity to design a range of HIIT programmes that could be tailored to a range of
143 settings, provided the intensity of the exercise is uniform and quantified (37). With this in mind,
144 the example HIIT protocol described to participants consisted of repeated 60-second high-
145 intensity bouts interspersed with 60 seconds of rest, based on previous HIIT protocols shown
146 to be effective for improving health and fitness in adults (38, 39).

147

148 *2.2 Study design and research ethics*

149 The reporting of our study adheres to the consolidated criteria for reporting qualitative research
150 (COREQ) (40). The formative evaluation used qualitative methods where focus groups with
151 employees and one-to-one interviews with management representatives were conducted prior
152 to intervention implementation. Teesside University Research Governance and Ethics Sub-
153 committee granted ethics approval (study number 053/17). Study participation was voluntary,
154 and all participants provided informed consent prior to data collection.

155 Following guidance on the reporting of qualitative research (40), to provide insights into the
156 perspectives they may bring to the work, brief details regarding the researchers involved in the
157 data collection and analysis of this project are provided. The first author was a female
158 postgraduate student with both positive and negative experiences of participating in group-
159 based HIIT. She had two years of previous qualitative research methods experience, had
160 received post-graduate level training in qualitative research methods and conducted all focus
161 groups, interviews and data analysis. Another researcher acted as a critical friend during the
162 analysis process. This researcher had experience delivering group-based exercise interventions
163 in healthy and clinical populations and had previous positive and negative experiences of
164 participating in high-intensity exercise.

165

166 *2.2 Recruitment and participants*

167 The first author contacted Local Authority Health Leads (Public Health Specialists employed
168 by local government) in Northeast England with preliminary study information. Local
169 Authority Health Leads acted as gatekeepers and distributed preliminary study information via
170 email to office-based organisations using their pre-established networks. Six organisations
171 expressed interest in participating via return email to the first author. The study was then
172 advertised via email distribution lists by human resources or occupational health departments
173 at each of the interested organisations. Participants were informed that the study purpose was
174 to develop a workplace exercise intervention and had no prior contact with the first author prior
175 to their involvement in the study.

176

177 Inclusion criteria were any employee of the participating organisations, aged over 18 years.
178 Employees were defined as any paid member of staff from the participating organisations. To
179 understand all working conditions in the organisations involved, no restrictions were placed on
180 length of employment or employment status (e.g. part time/ full time/ casual employment).
181 Exclusion criteria were inability to speak English and/or inability to provide informed consent.
182 As it was necessary to explore organisational perspectives of the proposed intervention,
183 management representatives were approached separately for recruitment. Management
184 representatives were defined as any employee in a senior management position within the
185 organisation. Using convenience sampling (41), 42 participants (38 employees, 4 management
186 representatives) were recruited from six organisations. Organisation and participant
187 characteristics are presented in Table 1. Participating organisations were urban medium (~100
188 employees in total) to large organisations (~2000 employees in total) with office-based
189 employees.

190 TABLE 1 HERE

191

192 **2.3 Procedures**

193 Data collection was conducted between June and November 2017, 5 to 10 months before
194 planned intervention implementation. Participant characteristics (age and sex) were collected
195 prior to the focus group or interview. Eight focus groups were conducted with 3 to 7
196 participants per focus group (Table 1). The focus groups provided an opportunity to elicit
197 opinions via group discussion rather than individual reflection (42). Each lasted between 34 to
198 64 minutes and were audio recorded and transcribed verbatim by the first author. This resulted
199 in 140 pages of focus group transcriptions (Arial, font size 12, 1.5 line spacing).

200
201 A management representative from four organisations consented to a one-to-one interview.
202 Management representatives from the remaining two organisations (study sites 2 and 4) did not
203 respond to recruitment attempts. Management interviews lasted between 21 to 33 minutes and
204 were audio-recorded and transcribed verbatim. This resulted in 35 pages of interview
205 transcriptions (Arial, font size 12, 1.5 line spacing).

206

207 **2.4 Focus groups and interview schedules**

208 The focus group interviews were designed to explore participants' perceptions and experiences
209 of workplace exercise, participants' perceptions of HIIT as an exercise modality conducted in
210 the workplace and participants' perceptions of the logistics of the proposed BE@Work
211 intervention. Interview schedules were developed based on our previous experience developing
212 and implementing HIIT interventions in community settings (35) and on aspects of workplace
213 exercise interventions described in extant literature (e.g. frequency, intensity, length of exercise
214 sessions and intervention and mode of exercise) (4). Focus group and interview schedules were
215 developed and piloted on a group of university employees prior to data collection. Following
216 pilot work, we re-ordered questions to improve the flow of the focus group or interview. Due

217 to limited time availability with management representatives, questions pertaining to the
218 managements' perspectives of HIIT were removed so that management interviews could focus
219 on their perspectives of the logistics of the proposed workplace HIIT programme. The
220 employee focus group and management interview schedules can be found in Supplemental
221 digital file 1. Briefly, discussions opened with participants describing their thoughts and
222 experiences of workplace exercise. Barriers and facilitators to workplace exercise were then
223 explored. Following some initial questions relating to HIIT and what participants perceived to
224 be HIIT, participants were provided with the following 'researcher definition':

225
226 *"HIIT is a type of exercise where you do bursts of exercise, always followed by a rest break,*
227 *repeatedly. During the bursts of exercise, you work as hard as you can, and you always get a*
228 *break afterwards. In the bursts of exercise your heart rate would increase, you would feel out*
229 *of breath and you wouldn't be able to speak in full sentences. By the end of each burst you*
230 *would need a rest break to catch your breath and be able to speak in full sentences.*
231 *HIIT will look different in different people. For example, for some people 'working as hard as*
232 *they can' is walking as fast as possible, and for others it is running as fast as possible. Both*
233 *people would be working at high-intensity, it is just that the intensity 'looks' different*
234 *depending on their fitness levels and ability."*

235
236 This interpretation of HIIT is based on a widely-accepted definition within the scientific
237 literature (27), the criterion for high-intensity exercise ($\geq 85\%HR_{max}$) (28) and the "talk test"
238 which is a subjective assessment of exercise intensity commonly used as a surrogate marker of
239 high-intensity exercise (43). After participants were provided with these items, discussion of
240 the participants' perspectives of the planned workplace HIIT intervention continued. The final
241 part of the focus groups and interviews focused on important aspects of workplace exercise

242 programme planning. Here, the preliminary BE@Work intervention plans were described to
243 participants (as described in Section 2.1), and discussion ensued about the participants'
244 perspectives of each intervention aspect (e.g., frequency, location, session and intervention
245 length and exercise modality).

246 *2.5 Analysis*

247 Focus group and interview data were analysed using directed content analysis (44) using NVivo
248 10. Directed content analysis was chosen because it has been successfully used to facilitate
249 intervention development in previous health promotion interventions (45, 46). In directed
250 content analysis the structure of the analysis is informed by previous research or theory (47).
251 As part of the purpose of this study was to develop an understanding of the participants'
252 perspectives of specific BE@Work programme elements, a pre-defined categorisation matrix
253 was developed based on standard exercise prescription nomenclature (frequency of exercise,
254 intensity of exercise, time spent exercising and type of exercise (48)) and important
255 intervention elements described in previous workplace HIIT literature (23) (Table 2).

256 Following familiarisation with the data, which involved transcription and re-reading of the
257 data, transcripts were read line-by-line by the first author and coded based on the pre-
258 determined categorisation matrix. After this initial coding, the data were examined within the
259 pre-defined categories and inductively coded to further explore participants' perspectives of
260 each intervention element. These codes were then grouped together according to their meaning,
261 similarities and differences to produce sub-categories (47). During the inductive coding
262 process within the predefined categories, as recommended in contemporary guidance for
263 qualitative research (49), the first author undertook a process of peer-debriefing with another
264 researcher. Here, the other researcher acted as a critical friend, asking the first author to justify
265 the rationale, rigour and consistency of all coding decisions within each pre-defined category

266 of the categorisation matrix (49). Given recent critiques of the concept of data saturation (50,
267 51), we did not seek to assess data saturation.

268

269 TABLE 2 HERE

270 ***2.6 Criteria for Judging Research Quality***

271 In line with contemporary guidance suggesting that the quality of qualitative research should
272 be assessed using an open-ended set of criteria (e.g. the worthiness of the topic of research,
273 rich rigor, meaningful coherence, sincerity, and significant contributions) (49), the following
274 section is presented to allow the reader to make their own judgement on the quality of this
275 research. From our perspective, the topic of this study could be considered *worthy* because
276 this is the first study to incorporate stakeholders' perspectives into the design and
277 implementation of a workplace HIIT intervention .This study demonstrated *rich rigor* by
278 collecting data from six organisations across five months, as well as recruiting both
279 employee and management representatives to explore organisational and employee
280 perspectives of the proposed intervention. This process resulted in 175 pages of qualitative
281 data. *Meaningful coherence* was achieved by using well-established qualitative research
282 methods to achieve the stated aims (i.e. to incorporate stakeholders' perspectives into the
283 development of a workplace HIIT intervention). *Sincerity* was demonstrated by declaring the
284 researchers' previous experiences with HIIT. Lastly, the study represents a *significant*
285 *contribution* to knowledge by providing a framework of methods to assist researchers and
286 practitioners to design bespoke workplace exercise interventions informed by stakeholders'
287 perspectives, which as yet does not exist.

288

289 **3.0 Results**

290 The following sub-sections present the findings from each of the pre-determined categories,
291 with illustrative quotes from participants. While employees and management representatives
292 were separated for the purposes of data collection and analysis, due to similarities in the views
293 and opinions reported, the findings of the employee focus groups and management interviews
294 are reported together.

295

296 ***3.1 General perceptions of workplace exercise***

297 Generally, participants perceived workplace exercise programmes positively. Some
298 participants reported that workplace exercise programmes may improve physical and mental
299 health and could facilitate a feeling of belonging or camaraderie within an organisation:

300 *“...to create an environment here where it’s an enjoyable environment. Where, yes work*
301 *is being done, but equally that people feel valued, that their health and their wellbeing*
302 *is important. And if they needed anything, it gives them the opportunity through sport*
303 *and through activity to be able to have better relationships and better ties with*
304 *managers and their colleagues”*. Management representative, male, study site 3.

305 However, some participants noted that workplace exercise programmes may lead to injury
306 which could lead to absenteeism (from work). Lastly, some participants thought that some
307 individuals may be unable or not feel comfortable to participate in workplace exercise:

308 *“I suppose at the end of the day it has got to be about personal choice as well...I think*
309 *if you start imposing [exercise in the workplace] I think that is when you will see*
310 *more resistance because people will be reluctant. Although they may want to, they*
311 *may not want to do it with a bunch of other people at work”*. Employee, male, study
312 site 4.

313

314 ***3.2 Barriers and facilitators***

315 Employees and management representatives discussed similar barriers and facilitators to
316 workplace exercise participation. Both employees and management representatives agreed that
317 work commitments would always be prioritised over exercise participation:

318 *“There’s no way on earth that you could say to somebody [client] mind your own*
319 *[workplace issue] for a minute while I just finish this work out off. You couldn’t... you*
320 *couldn’t bring yourself to, you would stop what you were doing [and attend to*
321 *workplace issue]”*. Employee, female, study site 3.

322 Similarly, the most commonly reported barrier was ‘lack of time’ because workload
323 commitments were perceived as high. Family or caring commitments were reported as barriers
324 which would prohibit employees from participating in exercise before or after work:

325 *“I was going to start rowing. But I can’t get child care to cover when the rowing classes*
326 *are. So, I can’t do that”*. Employee, female, study site 4.

327 A lack of workplace shower facilities was another commonly reported barrier, as shower
328 facilities were only available in one of the participating organisations. Participants reported
329 that a culture of long working hours within their workplace could make individuals feel unable
330 to participate in exercise during work hours:

331 *“...the culture of working such long hours as well. I know we have these arbitrary cut*
332 *points but sometimes I have worked 70-100 hour weeks. And that at one point became*
333 *kind of the norm. And when you are working those kind of hours, fitting anything else*
334 *in that isn’t eat and sleep is actually really difficult”*. Employee, female, study site 6.

335 The most commonly reported facilitator for workplace exercise participation was flexible
336 working conditions and autonomous workload planning. All but one of the organisations
337 operated flexible working policies where employees were permitted to arrange their own
338 working schedule between core working hours:

339 *“In this sector we are actually very autonomous in our time management and we all*
340 *manage our diaries independently. We have some fixed commitments, where we have*
341 *to be at certain places at certain times...I don’t have to go and ask if I can come to this*
342 *[focus group]. So I think within this sector there is some flexibility built into it. In other*
343 *sectors people have to ask to leave the workplace, ask to get permission if it’s something*
344 *unusual to leave the workplace maybe for a lunch break”*. Employee, male, study site
345 6.

346 Social support was reported as a facilitator for workplace exercise. Participants reported if they
347 were familiar with other people in a group-based exercise session they would be more likely to
348 attend. Social support was perceived as particularly important for inactive individuals:

349 *“Sometimes like you become a really good friend with the colleagues and you know*
350 *that they will never go for a run for whatever reason. But if you make it more fun and*
351 *actually get them to... encourage them to come along and have a go. And if they try it*
352 *and like it, they might continue”*. Employee, female, study site 4.

353 Similarly, management representatives felt it was important that they participate in workplace
354 health programmes with their employees, to promote employee participation. Lastly,
355 participants reported that a workplace exercise programme should be enjoyable.

356

357 ***3.3 High-intensity interval training***

358 . Before the ‘researcher definition’ of HIIT was provided, employees were asked about their
359 knowledge of activities they perceived to be HIIT. Although beyond the scope of the study to
360 ascertain the exact number of participants in each category, some participants were unaware of
361 HIIT, some were aware but had not participated in HIIT, and others had previously or currently
362 participated in HIIT, thus demonstrating a broad range of experiences within the sample. Those
363 who had some knowledge or had participated in HIIT previously reported that they had initially

364 heard about HIIT via ‘celebrity’ exercise videos or group exercise classes involving repeated
365 high-intensity bouts of exercise on treadmills or stationary bikes and circuit style exercise
366 classes.

367

368 Employees perceived HIIT to be a physically demanding form of activity that would result in
369 sweating, an increase in heart rate and feelings of breathlessness:

370 *“I don’t know jogging on the spot with your arms going up and down getting your heart*
371 *rate up, warming your muscles up, getting your heart rate going”*. Employee, female,
372 study site 1.

373 Examples of exercise modes that employees identified as HIIT were burpees, squat jumps or
374 shuttle run sprinting. Although infrequently discussed, some employees recognised the
375 intermittent nature of HIIT and that HIIT could be completed in a shorter amount of time
376 compared with traditional exercise modes. Some employees reported that HIIT could elicit
377 weight loss and ‘burnt calories’ more effectively other forms of exercise. Some employees
378 perceived that HIIT was not suitable for all individuals and one employee thought HIIT
379 conferred a risk of injury:

380 *“...I would be very concerned about trying to push it too far too fast, I would have to*
381 *really work up to any sort of high-intensity work very slowly now. Because of the*
382 *physical risks”*. Employee, male, study site 6.

383

384 One employee expressed the view that HIIT may not be appealing to all individuals based on
385 his experience of attending HIIT-type group exercise classes at his local gym where there was
386 a high turnover of participants:

387 *“I’ve been doing my [industry branded HIIT] classes for donks [a long time]... And I*
388 *know if you see anyone start new and they don’t come back. It’s the same people...*

389 *same 12 who have been going there for a couple of years every week, interspersed with*
390 *people who come and go, come and go. I don't think... it's definitely not for everyone".*

391 Employee, male, study site 4.

392

393 Following this initial discussion, employees were provided with the 'researcher definition' of
394 HIIT. The intermittent nature of HIIT was received positively by employees because the rest
395 breaks were perceived as sufficient to permit recovery:

396 *"And then like you say you get a rest to get your breath back and your oxygen levels*
397 *back up *laughs*. So that gets a tick".* Employee, female, study site 3.

398

399 Further, given the intermittent nature of HIIT, employees perceived the intensity to be more
400 manageable than initially discussed. Employees reported that because the intensity of HIIT
401 should be relative to each individual, HIIT could be manageable for less physically fit
402 individuals, which contrasted with their opinion before the 'researcher definition' was
403 provided:

404 *"The good thing about it [HIIT] is that you can tailor it so that if you have limitations...*
405 *presumably you can develop [high-intensity] bursts to be able to do something that you*
406 *can manage. As long as it is something that you can do and you do it as hard as you*
407 *can, doesn't it? That's the key to it isn't it?".* Employee, male, study site 4.

408

409 Given the short duration of the example HIIT protocol provided, employees reported that HIIT
410 would be a feasible form of exercise given the limited time frame available in the workplace.
411 One participant discussed that HIIT has a 'time/intensity trade off', where although the exercise
412 may be physically demanding, the lower time commitment required and positive feelings on
413 completion of HIIT may negate discomfort felt during exercise:

414 *“I think people would do that. Because the trade-off is, it’s not comfortable while you*
415 *are doing it, but when you asked us why we didn’t exercise we all said time. And the*
416 *benefit of this is that you do feel quite good after it and you can do it... give up 10*
417 *minutes maybe to do it”*. Employee, male, study site 6.

418 However, of particular importance to workplace HIIT interventions, personal hygiene was
419 reported as a barrier to participating in HIIT in the workplace. Employees felt that exercise at
420 high-intensity would result in sweating, so a shower and change of clothes would be required
421 before they could return to work, which would therefore increase the time requirements for a
422 session:

423 *“Assuming you break a sweat you will need to have a shower, get changed into and out*
424 *of the clothes that you would exercise in”*. Employee, male, study site 5.

425 **3.4 Intervention structure**

426 ***Frequency***

427 Although the majority of employees and management representatives agreed that thrice-weekly
428 exercise sessions would be acceptable, employees from one study site reported that twice
429 weekly would be more acceptable initially, with the possibility of increasing frequency to three
430 sessions per week after a number of weeks. Management representatives reported that daily
431 sessions would be too time consuming, yet once weekly sessions were unacceptable due to the
432 risk of individuals losing interest or being unable to attend one session and then missing a
433 whole week of the programme:

434 *“I think if you make it every day I think it might be more difficult. If you only make it*
435 *once per week people might lose enthusiasm”*. Management representative, female,
436 study site 1.

437 ***Timing of exercise sessions***

438 As previously mentioned, many of the organisations operated flexible working policies.
439 Although both employees and management representatives said this may facilitate individual
440 workplace exercise capacity, they discussed that group-based exercise sessions at a single time
441 point would likely be poorly attended. To overcome this barrier, employees and management
442 representatives requested multiple exercise sessions across the day:

443 *“I think you have to factor in your workplace commitments. And the nature that your*
444 *day can change from what you come into and what it becomes. I think the danger is if*
445 *you offer one session a week, say on a Wednesday at 1 o’clock. People can make it but*
446 *then something might happen and they drop off and might make some weeks and not*
447 *others. I think it has to be sessions that you have the opportunity to drop in. It needs to*
448 *be three sessions per week and you’ve got the opportunity to drop into a number of*
449 *sessions over the week”*. Employee, male, study site 4.

450 Employees expressed a preference for exercise sessions before work, at lunch time and after
451 work to avoid the intervention impeding on work commitments, which was supported by
452 management representatives.

453

454 ***Length of exercise sessions and intervention***

455 Employees and management representatives across all study sites were entitled to a 30-minute
456 break in the middle of the day. Therefore, they requested that exercise sessions did not exceed
457 this timeframe. Employees perceived that 60-minute exercise sessions would be too time
458 consuming:

459 *“I think an hour is a big commitment at the beginning or the end of the day”*. Employee,
460 female, study site 1.

461

462 Most employees reported that the proposed intervention length of 6 to 10 weeks was
463 acceptable; but there was no consensus between participants in terms of an exact preferred
464 duration. Management representatives were supportive of a 6 to 10 week intervention:

465 *“I think if you make something so far into the future that it is something that they can’t*
466 *see an end to, they will drop out”*. Management representative, female, study site 1.

467

468 **3.5 Exercise Modes**

469 Management representatives were supportive of whichever exercise modes were preferred by
470 their employees but expressed a preference for simple exercise modes that did not require
471 extensive exercise knowledge or experience.

472

473 Employees thought that walking, jogging and running would be feasible exercise modes, for a
474 range of fitness levels. This was due to most participants being aware of previous workplace
475 walking or running initiatives either in their current or previous workplaces.

476 Based on the ‘researcher definition’ of HIIT, employees acknowledged that for some
477 individuals, power walking would elicit a high-intensity response, whereas for others running
478 would be required. It was, however also acknowledged that walking or running would require
479 outdoor space and would therefore only be feasible during fine weather. Although this mode
480 was perceived as simple to understand, one employee reported that not all individuals may
481 enjoy running:

482 *“Running and jogging would be easier to understand it [the exercise modality], but at*
483 *the same time people may not like it because they don’t like to run.”* Employee, female,
484 study site 4.

485 Many employees reported that skipping was a novel and fun exercise they had frequently
486 participated in as a child but had not tried for some time. Some employees noted that to elicit

487 a high-intensity response, a level of skill would be required to continuously skip without
488 tripping on the rope:

489 *“You would need to be quite a skilled skipper to be able to go at full intensity for a*
490 *minute wouldn’t you? So a lot of people wouldn’t be able to be to complete it”.*

491 Employee, male, study site 5.

492 Employees discussed that boxing was a novel and interesting form of exercise, which may
493 relieve stress and would be fun because it required partner work:

494 *“The fact that you have got away from your desk and you have gone and punched the*
495 *living daylight out of a punch bag, you’ll probably feel a whole lot better in the*
496 *afternoon.”* Employee, male, study site 5.

497 It was noted that boxing would require a small space or room to be completed, which was
498 perceived as an important consideration for workplace exercise. Employees felt that some
499 individuals may not enjoy the technical or combative nature of boxing, especially with a partner
500 they did not know or feel comfortable with:

501 *“I’m not sure if it would be too technical. I just think some people might be a bit put off*
502 *if they haven’t done that type of thing before. If you said you haven’t exercised for years*
503 *you come here and we are going to do some non-contact boxing, get the pads on, get a*
504 *partner. Some people wouldn’t want to do that.* Employee, female, study site 4.

505 Another participant reported that boxing might be an activity that people would enjoy after
506 trying it once:

507 *“I think as well, it’s one of those things. I had never really done it before and my son*
508 *goes to a kick boxing class. And one of the guys was there and he asked would I mind*
509 *holding some pads for him, and then when you start hitting them you think ‘oh this is*
510 *actually quite good you know’, and you work up a hell of a sweat doing it.* Employee,
511 male, study site 4.

512
513 Stair climbing or stair stepping were perceived as feasible exercise modes because they were
514 simple, required no prior exercise knowledge, and could be completed using the facilities
515 available within the workplace:

516 *“I think everybody, even if they are not active at the moment, they would know what*
517 *stair stepping is. You’re not being put off by ‘I can’t run’ or ‘I can’t box’ or anything*
518 *like that. But everybody could do that one”*. Employee, male, study site 5.

519 However, some employees expressed concerns in relation to the safety of fast paced stair
520 climbing:

521 *“The first thing I think of is the safety issues. Because stairs is fantastic totally, and*
522 *even though we have the facilities, it’s not easy if you can run up. And the traffic of*
523 *people as well. And also I don’t think that stairs is safe for me, anyway”*. Employee,
524 male, study site 4.

525 Perceptions regarding dance as an exercise modality were polarised. Some employees reported
526 that dance would be particularly enjoyable and suitable for inactive individuals because it is a
527 familiar exercise mode for many:

528 *“I think though, if you are a beginner because that [dance] has been around for a while*
529 *a lot of people, they know what it is... and they know what they are going to do. And I*
530 *think they would be more inclined to go and do something like that than boxing. I’m*
531 *just thinking about some of the ladies in my office that would probably go along to that*
532 *because they know what to expect”*. Employee, female, study site 4.

533 While others reported that if dance were included in an intervention they would decline to
534 participate in the intervention at all, because they did not enjoy or feel comfortable dancing:

535 *“That is my idea of hell. I would never go anywhere near it... I have never been able to*
536 *dance I have my own weird sense of dance and I cannot put steps to music at all”*.
537 Employee, male, study site 5.

538 Most employees agreed that some level of dance knowledge or experience would be required
539 to permit high-intensity dance exercise. Additionally, it was noted that dance would be difficult
540 to facilitate in some workplaces due to the requirement for music which may disrupt the
541 working environment:

542 *“It might be more, I’ll use the word disruptive because our conference rooms... you*
543 *wouldn’t be able to accommodate that and obviously booking any bigger rooms would*
544 *be difficult I guess. So the location of that one may be a problem”*. Employee, female,
545 study site 4.

546 Yoga was discussed as a preferred exercise modality by some employees although it was
547 explained to participants that the intention was for the exercise to substantially increase the
548 heart rate which would not likely be possible with yoga. The participants did not express an
549 interest in any other exercise modes.

550 Despite individual differences in opinions of each of the reported exercise modes, all
551 employees agreed that a choice of modes should be available both between and within sessions:

552 *“So you say you’ve got your four, minute intervals... you can fill the four minutes with*
553 *the things you like doing. You might one day choose to do three boxing things or one of*
554 *each on one day, so you get variety. So for somebody who can’t skip very well, yes they*
555 *are not going to get much of a workout because you are forever faffing about [wasting*
556 *time] with the rope. Whereas if you can skip proficiently you know, I still think a minute*
557 *of skipping is hard work. Other people might disagree. Obviously running for a minute*
558 *is hard work if you make it hard work, going up stairs, I’ve punched a punch bag for a*
559 *minute that is crucifying. So it would all do the job. It’s just having the choice of which*
560 *one you want to do”*. Employee, male, study site 5.

561 Employees discussed that individual preferences should be taken into account to facilitate
562 enjoyment for a range of individuals. A choice of a variety of exercise modes between sessions
563 was perceived to be more engaging:

564 *“If you sold it to me that we just did stair stepping 3 times a week for 8 weeks I would*
565 *probably get bored. So I think it would be interesting to give different activities to do*
566 *as part of a programme”*. Employee, female, study site 4.

567 Lastly, many employees noted that some individuals may have physical limitations that
568 prohibit participation in certain exercise modes:

569 *“But classically someone who has got a bit of a dodgy knee or dodgy hip could come*
570 *to this and they know their body better than anybody else. They could say well I will do*
571 *that one or that one because I’ll be alright with it, but my knee won’t let me do that one*
572 *so I will leave it out [and] I will do the others*. Employee, male, study site 3.

573

574 **3.6 Overall programme considerations**

575 Overwhelmingly, group-based exercise was the preferred format for a workplace HIIT
576 programme because both employees and management representatives perceived that it would
577 increase motivation and compliance and provide an opportunity for networking and team
578 building. It was acknowledged though that for some individuals it might be important to have
579 the option to exercise individually:

580 *“Personally I think it would be better in groups. But I suppose individual choice would*
581 *come into it as well. So if somebody felt particularly uncomfortable doing some sort of*
582 *exercise with other people, then I just think it’s their choice at that point*. Management
583 representative, male, study site 5.

584 It was important to employees that workplace exercise sessions were facilitated as close to their
585 place of work as possible. Yet management representatives acknowledged that an indoor

586 location would be problematic for the facilitation of multiple exercise sessions across a day, as
587 available space was limited in most of the participating organisations:

588 *“It’s just finding that location. We do have a real problem with finding room*
589 *availability.”* Management representative, female, study site 6.

590 Outdoor sessions were perceived positively by employees because they would allow for a break
591 from the indoor office environment, but only if the weather was fine:

592 *“We went to go out for one (a walk) didn’t we once? We were going to go around here,*
593 *and we got outside and it started pouring down with rain and everybody just did an*
594 *about turn”.* Employee, female, study site 1.

595 Employees from one study site discussed offering “taster sessions” as a method of programme
596 promotion:

597 *“Those who are familiar with exercise probably won’t mind turning up to a class blind.*
598 *But when you are introducing something new, they [people unfamiliar with exercise]*
599 *need that bit of reassurance.* Employee, female, study site 4.

600 They suggested that during taster sessions potential participants could try a HIIT session before
601 they decided whether to participate in the intervention. This proposal was popular with both
602 employees and management representatives in subsequent focus groups and interviews.

603

604 ***3.7 Modifications made to the planned intervention based on participant feedback***

605 To fully illustrate how the focus group and one-to-one interview data informed the design of
606 the planned BE@Work intervention, the following section describes the modifications that
607 were made to the proposed HIIT intervention following data collection. The process
608 demonstrated herein could be used as a framework to guide the incorporation of employees’
609 and key stakeholders’ perspectives into the development of future HIIT or workplace exercise
610 interventions. A summary of the modifications is presented in Table 3.

611

612 The BE@Work intervention will be 8 weeks in duration. In our study, employees and
613 management representatives agreed that a short term programme (6-10 weeks) was acceptable,
614 and therefore we selected the mean intervention length used in previous workplace HIIT
615 interventions shown to be effective for improving health and fitness (23, 24). The frequency
616 and length of HIIT sessions (20 to 30 minutes, thrice weekly) were perceived as acceptable by
617 the majority of participants, so no modifications were made. Due to competing work and family
618 commitments, our participants stressed that flexibility in exercise session attendance was
619 important and proposed that several sessions be made available throughout the week.
620 Accordingly, the BE@Work programme will permit participants to self-select any three
621 sessions per week from four exercise sessions delivered every day. The sessions will be
622 conducted during the organisations “flexible hours” (i.e., early morning, lunch time and late
623 afternoon), when work related events are not held. As participants explained that a lack of
624 workplace shower facilities may be a barrier to participation during the work day, late afternoon
625 sessions may be more popular. Accordingly, two sessions at 4:30pm and 5pm will be
626 scheduled.

627

628 Participants requested a range of intervention activities - stair stepping, stair climbing and
629 boxing were the most popular. These modes were perceived as practical and novel within a
630 workplace environment. Lastly, a choice of three exercise modes will be provided within and
631 between HIIT sessions as participants perceived this would be critical to increase the reach of
632 the intervention and enhance adherence.

633

634 In line with preferences expressed by our participants, the scheduled HIIT sessions for
635 BE@Work will be group-based, with the option of individual sessions if preferred. Our

636 participants expressed a preference for exercise sessions that are conducted within, or at least
637 commence from and terminate at their workplace to limit travel requirements. As the planning
638 of exercise session location will be largely dictated by workplace room availability,
639 preparations will also be made for outdoor sessions where participants will meet within their
640 workplace, then proceed to a nearby outdoor exercise location. The walk will be incorporated
641 into the warm-up of the exercise session, to limit the time commitment required for the overall
642 session.

643

644 Based on our employee feedback, one-off taster HIIT sessions will be scheduled in the month
645 prior to BE@Work data collection commencement. Here, taster session participants will have
646 the opportunity to try HIIT activities based on stair stepping, stair climbing and/or boxing
647 before deciding whether they want to take part in the full intervention. An explanation of HIIT
648 will be given, including a description of the relative intensity of HIIT, which was deemed
649 important by our participants.

650 TABLE 3 HERE

651

652 **4.0 Discussion**

653 To date, the views of potential participants of health promotion programmes have been largely
654 overlooked (11, 52), and there remains few examples of how qualitative formative evaluation
655 can be used to tailor the design and implementation of exercise interventions, particularly those
656 delivered in the workplace. We aimed to illustrate how employee focus groups and one-to-one
657 interviews with management representatives can inform the development of a workplace
658 exercise programme, via a formative evaluation of a proposed HIIT intervention called
659 BE@Work.

660

661 In line with previous research (20, 53), our participants generally viewed workplace exercise
662 positively but reported that work commitments would be prioritised over exercise participation.
663 Indeed previous studies have highlighted employees concerns that workplace health promotion
664 interventions may distract from work tasks (54, 55). We therefore recommend that potential
665 participants' workloads are considered when planning workplace programmes and participant
666 research burden (e.g., time commitment associated with data collection and exercise sessions)
667 should also be minimised. Employees commonly cited barriers to workplace exercise were lack
668 of time or competing work priorities, family or caring commitments and lack of shower or
669 exercise facilities. Management representatives also suggested a lack of middle managers
670 support could be a barrier for employees, despite the support of senior management.
671 Employees' facilitators included flexible working conditions, senior management support, and
672 social support from colleagues. Management representatives echoed this, adding it was
673 important that management staff participate in workplace programmes to support employees.
674 Similar barriers and facilitators have been reported in previous work from public and private
675 sector organisations (e.g. 53, 56, 57), however as such factors are likely to be highly setting
676 specific (16), it remains vital to explore them in the environment where an intervention is to be
677 implemented.

678 In the specific context of HIIT, this is the first qualitative study to explore participants'
679 perspectives before intervention implementation, or indeed before participants may have tried
680 HIIT. Such an awareness is paramount due to the lack of literature on public perceptions of
681 HIIT (58), and concerns about the adoption and maintenance of HIIT in the general population
682 (59). Interestingly, some of the exercise modes our participants identified as HIIT (e.g.,
683 burpees, squat jumps or shuttle run sprinting), extended beyond those traditionally used in HIIT
684 trials (e.g. stationary cycling or treadmill running or walking) (28). This could be because some
685 participants had previously participated in what they perceived to be HIIT fitness classes,

686 which typically include similar exercises to those described (60). While more research is
687 needed to explore wider public perspectives of HIIT, our findings highlight how HIIT appears
688 to have transcended the scientific literature into the mainstream fitness industry. Though
689 beyond the scope of our study, this transition and associated public perceptions represents an
690 interesting avenue for future research.

691

692 When asked about workplace HIIT specifically, employee views varied. Some thought HIIT
693 would be a novel and engaging activity, particularly given the intermittent nature of the activity
694 and short duration. These findings are similar to those reported in a recent process evaluation
695 of a workplace HIIT intervention, where participants reported that the novelty of HIIT initially
696 attracted them to participate in the intervention (31). Additionally, the inbuilt rest breaks that
697 are incorporated into HIIT protocols have been viewed favourably by participants of HIIT
698 delivered in a number of settings including the workplace (22) gyms (60) and laboratories (61).
699 In contrast, some participants in our study reported that because HIIT would induce sweating
700 and breathlessness it may not be enjoyable or acceptable for all individuals in the workplace.
701 While documented experiences of HIIT often note feelings of subjective fatigue such as
702 breathlessness, increased heart rate or muscle fatigue which could lead to negative experiences
703 (22), it has been reported that some individuals can have positive subjective experiences
704 associated with HIIT (61, 62). One participant in our study perceived that participating in HIIT
705 may lead to injury. To decrease injury risk, we recommend that current exercise prescription
706 guidelines (e.g. pre-exercise screening, a thorough warm up and cool down and gradual
707 progression of volume or intensity of exercise (9)) are strictly adhered to.

708

709 The polarised views of HIIT described by our participants mirror debates seen in the academic
710 literature (59) , where the suitability of HIIT for the general population has been questioned.

711 Nonetheless employees in our study did note that if the relative intensity of HIIT and
712 intermittent nature were explained to potential participants (i.e., that HIIT can be enacted
713 differently depending on individual fitness levels and rest breaks are included in the protocol),
714 this may alleviate concerns about inactive individuals' ability to participate. This finding
715 highlights the importance of providing a detailed explanation of novel exercise strategies, such
716 as HIIT, to potential participants during recruitment as well as demonstrating the language that
717 could be used to describe HIIT in future interventions.

718

719 In our study, participant feedback informed the logistics of the resultant BE@Work
720 intervention protocol, wherever possible. Most importantly, the participants requested a
721 flexible schedule of group-based workplace exercise sessions, with a choice of different
722 exercise modes. Based on participant feedback, the BE@Work programme will offer multiple
723 HIIT sessions across the working week, with participants asked to attend any three sessions
724 each week. While this flexible schedule of exercise sessions may enhance attendance in the
725 BE@Work intervention, as reported in previous HIIT interventions (63) we acknowledge that
726 providing such a high volume of exercise sessions may not be pragmatically or financially
727 viable for some organisations outside of the context of a research study. In this case, a balance
728 would need to be sought between employee requests and the cost of an exercise facilitator.
729 Alternatively, as demonstrated in a recent workplace HIIT intervention (22) computer software
730 can facilitate the delivery of HIIT. This would allow employees to participate in workplace
731 HIIT at their convenience. However, given that participants in our study requested group-based
732 exercise and previous research has indicated that group exercise can enhance motivation and
733 reduce anxiety related to exercising alone in the workplace (20, 64); the suitability of computer-
734 assisted individual exercise in this particular setting may be limited.

735

736 In our study, while specific views regarding the use of different exercise modes in the
737 workplace were contrasting; boxing, stair climbing and stair stepping were the most commonly
738 preferred modes. These modes have been successfully used in community-based exercise
739 interventions previously, with heart rates indicating a high-intensity exercise response (24, 33,
740 35). Although this indicates that these modes could be incorporated into a HIIT protocol in
741 isolation, whether a HIIT protocol which incorporates different exercise modes can elicit a
742 high-intensity response is unknown and requires further investigation prior to intervention
743 implementation. This is particularly important in the context of HIIT, because it is the intensity
744 of exercise that is likely the driver for the physiological adaptations promoted by chronic
745 training (65).

746

747 Regardless of specific views surrounding individual exercise modes, our participants agreed
748 that the BE@Work intervention should provide a choice in a variety of exercise modes, both
749 within and between exercise sessions. This finding is encouraging, as variety in exercise modes
750 has been identified as a key facilitator to exercise intervention adherence (66), and a choice in
751 exercise mode has been shown to effect both motivation and psychological responses to
752 exercise (67). It is therefore surprising that most workplace HIIT interventions conducted to
753 date utilise a single exercise mode across the intervention (either cycling or stair climbing only)
754 (22-25). Our findings demonstrate that the use of a single exercise mode across a workplace
755 HIIT intervention may not facilitate adherence or compliance in some individuals.

756

757 Despite the novelty of our study in terms of findings and knowledge application, it is not
758 without limitations. As our participants were from organisations where employees were
759 predominantly office based, our data will likely not extend to other organisational
760 environments such as healthcare or manual labour settings. Further, we recruited a convenience

761 sample of participants, which could increase the likelihood of selection bias (41). Convenience
762 sampling assumes that the members of the target population are homogeneous (41), that is, that
763 there would be no difference in the research results obtained from a random sample. Given that
764 recruitment material for our study stated that the purpose was to plan a workplace exercise
765 intervention, it is possible that individuals uninterested in exercise would not feel willing or
766 able to participate, resulting in respondents who are already active or at least willing to
767 participate in exercise. Lastly, we are aware that some of the strategies applied to our proposed
768 HIIT intervention model would not be possible in other workplaces. For example, in
769 organisations without a flexible working structure, multiple exercise sessions spaced
770 throughout the day may not be feasible or scalable.

771 Nonetheless, we have shown how qualitative formative evaluation can generate important
772 considerations for the general planning of exercise interventions, using an example of a
773 proposed workplace HIIT intervention. By illustrating the specific way in which qualitative
774 data can inform the design of an exercise programme, we hope to provide a useful guide for
775 the methods that can be used for the co-production of future exercise training studies between
776 intervention developers, potential participants and key stakeholders. In the specific context of
777 workplace HIIT, our study is the first to explore adults' perspectives on HIIT prior to
778 intervention implementation and provides many novel and practical considerations into how
779 HIIT could be operationalised in the workplace. Given the recent inclusion of HIIT in the US
780 and UK public health physical activity guidelines (68, 69), and increasing interest in workplace
781 HIIT (22) the implementation of workplace HIIT initiatives could soon become commonplace.
782 The insights provided in our study therefore, could be particularly timely in aiding the
783 development of future HIIT interventions.

784

785 **5.0 Conclusion**

786 Using qualitative focus group and interview data from a formative evaluation of a workplace
787 HIIT intervention, we have demonstrated a process which will allow researchers and
788 practitioners to use employees' and managements' perspectives, to enhance the development
789 of future workplace exercise or HIIT interventions. Our data indicated that while the provision
790 of exercise opportunities within the workplace was generally viewed favourably, there are a
791 range of competing barriers (e.g., work demands or family and caring commitments) and
792 facilitators (e.g., flexible working conditions and management support) to workplace exercise
793 participation. In the specific context of our proposed workplace HIIT intervention, our findings
794 invaluable informed the logistics and content of the planned BE@Work intervention, including
795 the format of the intervention (i.e., group-based exercise sessions), exercise modes (i.e. a choice
796 between stair climbing, stepping and boxing within and between sessions) and timing of the
797 exercise sessions (i.e. flexible schedule of sessions across the week). Collectively, our study
798 demonstrates the vital role that formative evaluation plays in the development of exercise trials.
799
800
801

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1005 **Table 1 Organisation and participant characteristics**

Study Site Number	Type of organisation	Number of focus groups (n=participants)	Management interview	Mean age, years (\pm SD)	Percentage female
1	Charitable organisation	1 (n=3)	n=1	48 (\pm 7)	100
2	Charitable organisation	1 (n=5)	No response	43 (\pm 9)	80
3	Charitable organisation	1 (n=4)	n=1	32 (\pm 10)	100
4	Local authority	3 (n=12)	No response	40 (\pm 5)	50
5	Tertiary institution (support staff)	1 (n=7)	n=1	52 (\pm 5)	100
6	Tertiary institution (academic staff)	1 (n=7)	n=1	44 (\pm 14)	30

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1008 **Table 2 Categorisation Matrix**

Category	Description
General perceptions of workplace exercise	General perceptions of the acceptability and feasibility of workplace exercise or physical activity interventions
Barriers	Elements of participants working environment that are a barrier to an employee's ability to participate in exercise in the workplace
Facilitators	Elements of participants working environment that facilitate an employee's ability to participate in exercise in the workplace
Intervention structure: Frequency	Views and opinions on frequency of exercise sessions in the workplace
Intervention structure: Time	Views and opinions of timing of exercise sessions in the workplace
Intervention structure: Length of exercise sessions	Views and opinions on length of exercise sessions in the workplace
Intervention structure: Length of the intervention	Views and opinions on intervention length
High-intensity interval training: before definition	Views and opinions of HIIT before definition of HIIT was provided
High-intensity interval training: after definition	Views and opinions of HIIT after definition of HIIT provided
Exercise modes	Views and opinions of different modes of HIIT in the workplace
Overall programme considerations: Group based vs. individual exercise	Views and opinions of group based exercise or individual exercise sessions in the workplace
Overall programme considerations: Location of exercise	Views and opinions on exercise locations within/nearby to the workplace
Overall programme considerations: Programme promotion	Views and opinions on how to promote a workplace exercise programme within the workplace

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1011 **Table 3 Modifications made to the planned intervention protocol based on participant**
 1012 **feedback**

Intervention component	Initial BE@Work plan	Modifications made	Rationale
Frequency	Three sessions per week	No modifications made	Employees and management perceived this frequency as acceptable.
Time of day	Guided by participant and organisation requirements	Multiple exercise sessions facilitated across the working week	No single time point would suit all availability, flexibility needed
Length of exercise sessions	20-30 minutes	No modifications made	Session fit within 30-minute lunch break, perceived as acceptable by employees and management
Length of intervention	6-10 weeks	8 weeks	Short term programme perceived as acceptable to employees and management teams alike. Length based on mean length of previous workplace HIIT trials.
Intensity	HIIT	No modifications made to intensity of planned exercise Relative intensity of HIIT explained to potential participants in BE@Work promotional material	Explanation important for potential participant understanding of HIIT
Modality	Guided by participant choice. Examples given to participants: walking/ jogging/ running, stair stepping, stair	A range of activities within an intervention Stair stepping, stair climbing, boxing	Participants reported a preference for these modes Choice in a variety of modes most important

	climbing, boxing, skipping, dance		
Individual/ Group based	Guided by participant choice	Group based with option for individual sessions if requested	Group preferred but choice of group/ individual exercise important
Location of exercise	Guided by participant requirements and availability of space in the participating organisation	Meeting room booked in advance where possible However, 70% of sessions conducted outdoors but commencing from the main foyer of the organisation	Outdoor exercise sessions acceptable for participants however location largely based on room availability
Promotion of a programme	Guided by organisational facilities and participant suggestions	“Taster” exercise sessions facilitated in the fortnight before baseline data collection Emails sent via all staff email distribution lists Advertisements placed in organisational newsletters and on notice boards in prominent places around the workplace	Participants requested one-off taster sessions of HIIT before they decided to participate in the full programme.

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