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Prehabilitation for recreational runners

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Abstract

Context: Injury prevention programmes are effective when implemented in team sports, but many recreational runners have less access to such focused interventions or peer support and often seek other sources to learn about injury-reduction strategies. **Objective:** This study aimed to explore runner's motivations to attending a prehabilitation (prehab) for runners' workshop; establish their comprehension of prehab; and identify barriers to ongoing engagement with injury prevention.

Design: Qualitative study using focus groups. **Participants and setting:** Twenty-two runners participating in prehab for runners' workshops took part in one of four focus groups, each recorded, transcribed and analysed using Grounded Theory to create codes, subthemes and themes. **Results:** Four themes emerged: (1) Participation was influenced by experience of previous injury and worry of cessation of running. As the workshop ran weekly for four weeks, opportunity to see someone more than once who was also a physiotherapist influenced participation. (2) Runners welcomed clarification for online exercises and advice suggested for runners. They were surprised by the difficulty of single-leg neuromuscular facilitation exercises, and reported benefit from most or all information especially non-exercise based approaches such as load management, pain-monitoring and running cues. (3) Participants were empowered by a structured, holistic and evidence-based approach that embraced autonomy for exercise self-selection and progression. Confidence to engage in open discussion was due to small group size. (4) Barriers to prehab were personal responsibility, equipment, time, lack of supervision, and peer-influence. **Conclusion:** A composite approach to strategies for injury risk reduction during prehab, combining progressive exercises with educational resources can address runners' individual needs. Early discussion of motivational tools on commencement of prehab with guidance from runner's on how to incorporate prehab independently into running training is recommended. Providing these tools allows runners to self-identify the approach best suited to their personal running profile at that given time.

Keywords: Running-related injury (RRI); load management; pain-monitoring tool; injury prevention; prehabilitation

28 Running has gained popularity in recent years, due to its convenience, low cost, and health
29 benefits,^{1,2,3} as well as meeting recommended physical activity guidelines.⁴ Unfortunately, rates of
30 Running Related Injury (RRI) remain high, particularly in those new to running.^{5,6} RRI is the most
31 common reason for discontinuing the sport, particularly novice runners.⁶ Moreover, runners who
32 sustain a RRI are less likely to engage in other types of activity⁷ and thus could be at risk of lowering
33 their general physical activity. Therefore, injury prevention strategies in runners are needed to
34 maintain engagement with running. Despite a growing body of research on injury prevention
35 strategies for runners, interventions which use exercise-based programmes^{8,9} or online education¹⁰ in
36 isolation have not shown a significant reduction in injury rates. Rather more promising, a foot and
37 ankle-strengthening programme that was supervised for the first 8-weeks showed a significant
38 reduction in RRI in recreational runners.¹¹ Compliance was high during the initial 8-week supervised
39 phase of that programme. However, when the programme was managed remotely after this,
40 compliance dropped to less than 50% by 40 weeks.¹¹ This suggests runners need at least some initial
41 supervision for such interventions to be beneficial, compared to less formally supervised
42 interventions.^{8,9,10}

43

44 Supervised injury prevention exercise programmes during warm-ups in team sports such as football
45 have also shown reduction of injury, with higher compliance and adherence increasing
46 effectiveness.^{12,13} However, recreational runners who train on their own may not have the same access
47 to the support and education which athletes training within a team environment may get from coaches
48 and peers. Even runners who do train in a team environment such as an athletic club or running group
49 appear to have less exposure to injury prevention strategies than other sports. When running coaches
50 were asked in an online survey about regular injury prevention practices they reported they were less
51 likely to incorporate injury prevention strategies into training than other practices such as warm-ups
52 and cool-downs.¹⁴ This was not because they thought it less important, but rather, they had less
53 knowledge of what best practice in injury prevention is. Most coaches would include injury
54 prevention into their runners regular training, and predominantly looked to sports physiotherapists for
55 guidance on implementation of injury risk reduction strategies.¹⁴

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Physiotherapists and rehabilitation specialists are becoming increasingly involved in the promotion of physical activity, and prevention of injury for healthy populations, but reaching out to the non-injured sports populations can be challenging, particularly the recreational runner who trains individually¹⁴. Therefore, questions remain around the degree of supervision and format of running injury prevention programmes, and how to best facilitate runner buy-in and engagement. Gaining a better understanding of what runners actually *want* in terms of type, format and delivery of injury prevention information, and to identify the challenges of preconceived ideas is needed. For example, Saragiotto and colleagues¹⁵ found recreational runners had beliefs on factors related to RRI such as stretching and running shoes that were unsubstantiated by the literature. They concluded runners needed to be better informed.¹⁵ Runners may typically undertake a less deductive approach to injury prevention, choosing instead to source information from a range of online sources available on running, making it paradoxical for runners to select the most appropriate approach.

Prehabilitation (prehab) provides a multifactorial approach incorporating both exercises and educational methods to reduce likelihood of injury¹⁴ and may reach out to a wider spectrum of runners with variable training habits whose aetiology of RRI are unique to their own individual profile. Preventative measures for RRI require consideration of the individuality of runners and their personal conceptualizations. A qualitative approach has been suggested as a way to provide insight and understanding of an individual's beliefs, thoughts and comprehension,¹⁶ and this knowledge can then be used to inform better practice. Therefore, the current study aimed to listen to the runners' perspective to (1) establish what motivates recreational runners to take part in a "prehabilitation for runners' workshop, (2) explore their comprehension of injury prevention strategies taught, and (3) identify what they perceive as barriers to running prehab.

84 **Methods**

85 **Design**

86 This study was a qualitative design, using focus groups to explore runners' reasons for participating in
87 and engaging with a prehab for runners' workshop. Qualitative methodology in injury prevention
88 research provides a deeper understanding acquired directly from the runner's perspective.

89 Investigating a runner's beliefs and attitudes in order to discover the associated factors influencing
90 participant's behaviour and engagement with injury prevention is needed.¹⁶ This approach embraces
91 the runner's perspective on both their interpretation, and their response to injury prevention strategies.

92 Listening to the runner's voice is essential to gauge so that those implementing programmes can
93 address their runner's needs most effectively. Therefore, for the focus groups, structured open-ended
94 questions were formulated around participation, expectations, perceptions, and engagement (online
95 Supplementary Appendix 1). These followed similar questions used in qualitative research for other
96 exercise-based programmes,¹⁷ and which were further adapted and refined for this study to
97 accommodate a runner specific injury prevention programme. The Consolidated Criteria for
98 Reporting Qualitative Research (COREQ) checklist was used to ensure quality of study design.¹⁸

99

100 **Participants**

101 Runners already participating in one of four prehab for runner's workshops over the course of six
102 months during 2019/2020 were invited to participate. The prehab workshop consisted of four
103 interactive, one-hour weekly sessions run by a physiotherapist. Each session consisted of specific
104 exercises focussed on neuromuscular facilitation, balance, strength, plyometrics, flexibility, and
105 running cues that were progressed in difficulty over the four-week period. Education incorporated
106 advice on warm-ups, cool-downs, recovery, footwear, training errors and load management, the use of
107 a pain-monitoring tool, and graduated return to running programmes. Further details of the workshop
108 can be found in online Supplementary Appendix 2. Inclusion criteria for the study was workshop
109 attendance and being aged 18 or over. Ethical approval was obtained from XXX (approval number
110 2478) and participant written informed consent was obtained.

111

112 **Procedures**

113 A focus group took place immediately on completion of each participants' final workshop session,
114 hence 4 focus groups took place in total. Focus groups were conducted in the same environment as the
115 workshop to ensure it was a familiar setting to them. All interviews were audiotaped using a Philips
116 audio recorder (DVT1110 Digital VoiceTracer). Field notes were taken during the focus groups. The
117 main researcher (LL) who also conducted the workshops conducted the first two focus groups. As
118 prior involvement with study participants may influence participants' responses,¹⁷ an independent
119 researcher (MB) with experience in facilitating focus groups and who was unfamiliar to the
120 participants conducted the remaining two focus groups. Both researchers followed the same structured
121 open-ended questions. They were encouraged to use these for reference but could pose each question
122 in any order so conversation could flow freely.

123

124 **Data analysis**

125 The Grounded Theory approach described by Bradley et al (2007) was used for data analysis.¹⁹ The
126 first part in the process is to improve familiarization with the data, and all audio files of focus groups
127 were transcribed verbatim by the main researcher (LL).^{19,20} These were listened to and reread several
128 times for accuracy. Then transcripts were read and re-read by all 3 researchers involved in the data
129 analysis to allow further familiarisation of the data. Next, data coding was carried out using Microsoft
130 Excel (Microsoft Office Professional Plus 2016) by each researcher independently. Codes were given
131 to the data, and from these codes, subthemes were derived, and from there, themes were identified.
132 When all researchers had completed this process, LL and SV discussed, challenged, and refined
133 themes and subthemes.

134

135 Bradley et al (2007) recommends when coders agree reliability, one coder should complete the coding
136 again independently using the agreed codes.¹⁹ For this final stage the main researcher (LL) used
137 NVivo 19 Pro (Windows Release 1.4.1) to perform the final round of data analysis using the finalised
138 and collectively agreed codes, themes and sub-themes. This software can facilitate a deeper and more

139 complex understanding of the data and provide easier visual inspection.²⁰ On completion, the main
140 researcher (LL) conferred with the other researchers (SV, MB), and this ensured 100% of data was
141 joint coded.

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Results

145 From the 30 workshop participants, 23 consented to take part in this study. Due to other
146 commitments, one was unable to attend, leaving 22 who took part across 4 focus groups. Participant
147 demographics are shown in Table 1.

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< TABLE 1 >

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151 Each focus group lasted between 24-50 minutes. After the 4th focus group, researchers LL and MB
152 agreed data saturation. Four themes were identified.

153

154 **Theme 1: Motivators for initial engagement in a prehab for runner's workshop**

155 Participants were motivated to take the workshop to maintain running continuity without injury. Many
156 runners had undertaken rehabilitation before for RRI, and welcomed the concept that prehab could
157 prevent the injury cycle they felt they were in. They liked the preventative concept and sought some
158 understanding as to why return to previous levels of running post-injury may have been unsuccessful:

159

160 *“...breaking that cycle of constantly being on the mend, looking forward to running, going*
161 *out running, then thinking “why did I ever go out running” because I’m back at square one*
162 *(P16).”*

163

164 Others had a perception that pain during running in the context of effort was expected and wanted to
165 differentiate this from actual injury. Some felt running should not require extra effort to perform it,

166 but that perhaps a sedentary lifestyle was having a negative impact on the ability to move naturally
167 and sought to find strategies to make running more effortless.

168

169 Participants wanted to gain direction from a professional on injury prevention strategies they had
170 accessed online. They expressed they did not understand what some of the online terminology
171 referred to, such as “gluts”, and “strength training”. Overall, although amenable to the internet for
172 information, participants were wary about what online content they could trust and frustrated at
173 conflicting information:

174

175 *“...for every fact or direction you find, you’ll find somebody else saying the opposite... (P6).”*

176

177 Participants stated face-to-face supervision and opportunity to seek a professional opinion had
178 motivated them to attend the workshop. They had also had conflicting information from peers and
179 sought reassurance:

180

181 *“yeh, I got that advice from many people... don’t do it, it’s going to wreck your joints, your
182 knees, your ankles will go, just forget it, yes. Can you believe it? (P21).”*

183

184 They felt the workshop was an opportunity to have discussion and clarity on information, and to find
185 an injury prevention strategy that was specific to them as an individual.

186

187 Theme 1, subthemes and further example quotes are found in Table 2.

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189 < TABLE 2 >

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191 **Theme 2: Developing awareness and perceived understanding of injury prevention**

192 Participants had variable prior knowledge of injury prevention. Most stated they *knew* about warm-
193 ups and cool-downs, but did not understand what they encompassed, the principles for performing

194 them, or their relevance to injury prevention. They had confidence in running shops providing them
195 advice on footwear. However, running cues were new to participants, and those that tried them in the
196 workshop perceived they produced immediate benefits, not just to running, but walking as well:

197

198 *“the gait [cadence advice] was tremendous...it’s made a difference to my walking as*
199 *well...(P5).”*

200

201 The specificity and detailed explanation of exercises during the 4-weeks of the workshop promoted
202 runners to develop self-awareness of their own body. Single-leg exercises were reported as most
203 challenging, and the majority of participants had never performed neuromuscular facilitation exercises
204 before. Increasing awareness of the kinetic chain also exposed areas related to a recurrent injury, and
205 participants with previous injuries often found there was some weakness or difficulty utilizing the
206 areas proximal or distal to the previously affected area:

207

208 *“...because I now realise that pain is probably lying to me, that it hurts somewhere, but*
209 *actually when you start to move a little bit you realise that ahh, it’s because it’s another bit*
210 *(P9).”*

211

212 Participants welcomed variety, the ability to self-pace their progressions, and to have the autonomy to
213 modify exercises in response to pain. The ability to utilize the Pain Monitoring Tool was helpful to
214 make a decision on modifying training load. This also provided confidence to adapt training rather
215 than fixating on always completing a training session:

216

217 *“Even just...to consider what is zero to ten on the pain scale... Just that little advice was*
218 *actually really useful (P20).”*

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220 They also gained confidence that if an injury did occur, they would be more prepared for it, and that
221 during recovery, return to running should be more gradual:

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“when I think about it, it makes common sense really, you need to take it easy...start again, do the C25K...yes, so I feel like I am better equipped to start running again without getting an injury as opposed to before when you stop running for a while and you just go back into 7km (P12).”

Theme 2, subthemes and further example quotes are found in Table 3.

< TABLE 3 >

Theme 3: Empowerment for supported delivery of injury prevention

The workshop format gave participants confidence and buy-in to engage with running injury prevention. The small group size (maximum 9 runners) enabled runners to ask questions and promoted open discussion. Attending the workshop more than once gave opportunity for questions on the previous week’s content and permutation of exercises. There was a consensus that a single session would have been less popular, but also more than four sessions would be harder to commit to:

“If it had just been a one off then I wouldn’t have come along...it was more to me, crumbs, this is different...you’ve got that progression expectation...(P8).”

A multifactorial approach gave grounding for participants to select material most appropriate to them. The variety of injury prevention strategies offered to the participants appeared to appeal to them, learning both from educational resources, and from an exercise-based approach. Having the autonomy to self-identify what information or exercises were most applicable to them, was enabled largely by the format of the workshop and helped embed the information:

“The interesting thing I think for me is finding out through the exercises where suddenly you notice weakness...Yeah, something to work on (P21).”

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Exercises were designed for home or outdoors rather than the gym and participants preferred this rather than having to use any equipment. There was no pressure in the workshop for anyone to push beyond their boundaries and they appreciated options for alternative versions of exercises, and levels of difficulty:

“I think building up from an easy base every week is very helpful. Everyone was at different levels for different exercises so if you just chuck everyone in at a difficult level that you can’t do, then you might never ever do it again (P13).”

In addition, understanding why a particular piece of advice was given, or why types of exercises were taught created engagement and participants felt they were making changes independently. Support from literature was welcomed and this reinforced practical content. Participants who independently identified where they needed to focus were motivated to continue. Overall, participants appeared able to gain benefit from some or all of the information.

“It’s a much more holistic approach rather than pin-pointing stuff and playing with it, so it’s giving you a better overview of ourselves...(P16).”

Theme 3, subthemes and further example quotes are found in Table 4.

< TABLE 4 >

Theme 4: Barriers to prehab

For some, the volume of content was overwhelming, and consolidation was needed. Participants suggested motivational tools should be discussed at the start of the programme where everyone could agree on how they would commit during the workshop. Fitting prehab around running and lifestyle

277 appeared to be dependent on mind-set, but those who had already incorporated prehab into a routine
278 found it most convenient to do so pre-or post-run:

279

280 *“I have been doing about 20 minutes before running and it’s made an incredible difference*
281 *(P2).”*

282

283 Participants worried they might forget exercises due to lack of videos, and generic names for
284 exercises would be helpful. Regular practice was suggested as necessary to help embed the exercises,
285 and those that had practised over the 4-weeks found repetition had helped, whereas those who did not
286 felt they needed more support. Lack of a refresher course or longer-term peer-support and training
287 alone were barriers. One group of workshop participants even formed a running group together:

288

289 *“There’s maybe more incentive if you are part of a casual group or whatever, to keep doing it*
290 *(P16).”*

291

292 However, peer influence could also negatively affect adherence and it was expressed that if others are
293 not in the same mind-set, this could influence motivation to continue with injury prevention
294 strategies:

295

296 *“I belong to this blasé running club where basically you do intervals and then you go to the*
297 *pub...I must say they don’t do exercises; no one talks about them. That’s the only reason I*
298 *might stop...I don’t know how many people has this ethos...of training yourself to prevent*
299 *injury. Most people just run don’t they (P21)?”*

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301 Theme 4, subthemes and further example quotes are found in Table 5.

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< TABLE 5 >

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Discussion

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This study explored how runners perceive and respond to injury prevention information and identified the complexity of motivations driving runners to become better informed. Runners were able to describe facilitators that empowered them to keep focused and engage with the workshop content, and barriers to running prehab moving forwards were determined.

Runners' motivations for prehab and response to new concepts

Recreational runners in the current study exhibited variable general knowledge of injury prevention strategies. They reported a need for maintaining longevity with running, with the memory of previous injury, or worry of future injury as main motivation for attending the workshop, and sought to find a different strategy to what they may have tried before. For most, running cues were a new concept. Previous research found gait retraining for just 2 weeks improved patellofemoral function and pain,²¹ and reduced occurrence of RRI at 12 months²² suggesting it has immediate benefits and is quick and effective to include within running. Running cues have been shown to alter kinematic and kinetic parameters,²³ therefore the perceived differences participants felt during their running may also have been related to biomechanical changes and running efficiency. All runners expressed they would engage with running cues going forwards. This may also reflect runners preferring a strategy that is convenient to introduce directly into running, rather than finding time to complete separate prehab exercises.

Facilitators for prehab, and self-awareness of individual needs

Some participants in the current study had already incorporated exercises pre-run as a way of merging prehab into their running. As integration into daily life is needed for ongoing adherence following supervised exercise programmes,³⁸ incorporating exercises into running similar to the FIFA (Federation Internationale de Football Association) 11+ warm-up in football should be supported.³⁹ In a previous survey, although only 67% of running coaches gave advice on prehab, 80% suggested incorporating injury prevention strategies into training would help facilitate adherence with their

332 runners.¹⁴ Interestingly, 73% of runners in the current study were not members of a running club
333 where they may have more exposure to supervision and running education, and this may reflect that
334 this cohort of recreational runner is more likely to seek information elsewhere.

335

336 When introduced to single leg exercises, participants reported finding them most challenging but
337 experienced improvements as the workshop progressed. Neuromuscular changes correlating with
338 enhanced performance are generally gained rapidly when starting any new exercise.²⁴ As well as
339 providing proprioceptive challenges to the lower limb,²⁵ proximal muscles particularly those of the
340 hip and pelvis also provide a stabilization role during a variety of single leg exercises.²⁶ The runners
341 in the current study welcomed research-based explanations that clarified hip muscle function, having
342 *heard* gluteal muscles were important in running. The role of hip muscles during gait is complex and
343 not solely reliant on just the gluteal muscles.²⁷ However, Gluteus Medius is most active during the
344 stance phase of running,^{28,29} and as greater contralateral pelvic drop was found to be the most reliable
345 variable to predict injured runners³⁰ targeting this in exercise programmes has been suggested to
346 reduce likelihood of RRI.²⁸ Having variations of exercises and explanations for why an exercise was
347 introduced was also reported by participants as important to help engagement. When performing any
348 motor control task, if people are given more options and choice, there is enhanced learning,
349 performance benefits and self-efficacy,³¹ and this autonomous approach was reflected in the design of
350 the prehab workshop.

351

352 Prehab incorporates not just exercises but also education, and runners in the current study embraced
353 load management and monitoring advice having never considered this before. Following previous
354 injury many runners in the current study reported they had gone back into their usual training rather
355 than taking a graduated approach. Thus, these runners sought and responded to strategies specific to
356 them, to help manage, adapt, and support their running, and provide empowerment for self-help in
357 reduction of RRI that were not necessarily exercise-based. Autonomy to self-modify exercises and
358 education on adjusting running in response to injury, lifestyle, and illness utilizing a scale of 1-10
359 such as The Pain Monitoring Tool was reported as useful.³² Running with pain is not uncommon in a

360 general population of recreational runners,³³ but a pain intensity scale can guide a runner when to
361 modify and adapt loading, rather than the body devising subconscious alterations in muscle
362 recruitment and compensatory patterns of movement leading to tissue changes elsewhere. A recent
363 study of elite middle-distance runners found they assumed pain to be unavoidable but meaningful and
364 had developed experience with coping strategies to categorize pain as either, “expected” where they
365 ran through it, or when “different”, they related it to RRI and adapted their training.³⁴ The recreational
366 runners in the current study expressed an inability to dissociate pain like this and welcomed guidance.
367 Previous misconceptions that running was harmful to joints was explored during the prehab workshop
368 and runners were receptive to the literature on this subject, particularly that knee joint loading during
369 running has not been found to be harmful to articular cartilage.³⁵

370

371 **Knowledge supports runner’s empowerment to engage in prehab**

372 It is suggested that neuromuscular impairments persist following injury despite the runner having
373 returned to running,²⁴ and in the current study 91% of participants had had a previous RRI. They
374 reported becoming more cognizant their recurrent injuries were possibly associated with other, more
375 proximal and/or distal areas to their site of pain. Whereas a clinician will be trained to look for
376 compensatory movement patterns and adaptive postures post-RRI, and address these with
377 neuromuscular training,²⁵ the runners in the current study found self-identifying the problem helpful
378 for engagement with injury prevention strategies. Therefore, a supervised, structured, and holistic
379 approach, which provided progressive information and a variety of strategies that runners could self-
380 identify with, was helpful for the runners to feel they were able to take ownership of injury
381 prevention, and thereby breaking the cycle of seeking help *after* an injury has occurred.

382

383 Incomplete rehabilitation may also be the reason why injury prevention programmes have been more
384 successful for previously injured athletes. For example, Andersson et al found an exercise-based
385 handball injury prevention programme reduced overuse shoulder injury risk by 28%, but when only
386 players with shoulder injuries at baseline were included there was 35% lower injury risk reported.³⁶

387 This suggests injury prevention programmes that incorporate neuromuscular challenges, strength and

388 plyometric exercises may provide additional benefits for athletes that return to sport post-injury. As
389 previous history of injury is the most reported factor related to RRI,³⁷ focusing injury prevention
390 programmes on runners with a history of previous RRI may be more beneficial. This is a view that has
391 been expressed previously in the literature.^{10,37} Even participants in the current study who thought RRI
392 was inevitable conceded they now had strategies to manage their running which they had not
393 previously considered.

394

395 **Barriers to prehab**

396 Despite aspirations to engage with injury prevention strategies moving forwards, runners can foresee
397 barriers to engagement. Similar to other studies,¹⁴ equipment, time management, difficulty getting into
398 a routine, lack of supervision, and peer-pressure were suggested as barriers. Interestingly, discussion
399 of barriers during the focus groups led to participants' also suggesting ways of addressing them. By
400 discussing barriers early in the prehab workshop, runners may find they have strategies to overcome
401 them before they become an obstacle. Identifying motivational tools specific to each runner and
402 addressing these early in the program could support adherence with ongoing prehab.

403

404 **Limitations**

405 The runners in the current study were a heterogeneous group with a wide variation in running
406 experience ranging from 5 months to 40 years, but despite this all had a common goal to engage in
407 prehab, and expressed benefit from most or all of the content in the workshop. All runners had self-
408 referred to the prehab for runners' workshop therefore had already made the decision they wanted to
409 change their practice. Therefore, challenges exist on how to reach other groups who are unaware of
410 reduction of injury risk practices. The focus groups took place directly following completion of the
411 final workshop, thus runners may have had less time to absorb and consolidate the content. The
412 person conducting the workshop also facilitated 2 of the 4 focus groups, but to ensure this did not
413 affect responses from participants, a facilitator who had no previous contact with the participants
414 conducted subsequent focus groups to ensure there was no bias in responses.

415

416 This study aimed to look at runners' perceptions on taking part in a prehab for runners' workshop, but
417 no follow-up data was collected to assess whether RRIs had reduced using this approach. With such
418 wide variations in recreational runner's profiles, it is difficult to adopt a single approach as previous
419 injury prevention studies in other sports have done, often investigating athletes within a similar sport,
420 with similar age, carrying out the same training program, under supervision from the same coach.
421 This is not representative of many recreational runners, who vary in their personal and physical
422 profiles, and have running goals ranging from 5km to ultradistance. Future research should consider
423 the complexities of the recreational runners' personal profile, and injury risk reduction approaches
424 should aim to be runner-centred and have the capacity to flex and adapt to each individual.

425

426 **Conclusion**

427 We found that runners have a wide spectrum of perceptions, experiences and knowledge of injury
428 reduction strategies. It is therefore unsurprising that one specific approach may not be effective for all
429 runners collectively, therefore, a multifactorial approach appears more beneficial. The participants in
430 this study engaging in a 4-week progressive prehab for runners' workshop were able to self-identify
431 exercises and educational needs specific to them yet welcomed additional information and resources
432 for future use. Runners also appreciated the opportunity for discussions about prehab with
433 professionals. They felt supervision was necessary for learning exercise technique and progressions,
434 and face-to-face contact with someone provided a better understanding of injury prevention strategies
435 and load management. To promote engagement and adherence to injury prevention programmes,
436 supervised support incorporating motivational strategies, and providing the tools that give options for
437 runners to create a programme best suited to their individual needs is recommended.

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Table 1: Participant demographics

Mean \pm SD age, years (range)	Gender n (%)		Mean \pm SD running years (range)	Main running goal in the next year n (%)							Member of running club n (%)	Previous running related injury n (%)
	M	F		Run injury free	5K	10K	½ marathon	Marathon	Ultra marathon	None		
44.8 \pm 13.8 (24-68)	12 (54.6)	10 (45)	13.8 \pm 11.3 (0.5-40)	5 (22.5)	3 (13.9)	4 (18.1)	4 (18.1)	3 (13.6)	1 (4.5)	6 (27.2)	6 (27.2)	20 (91)

Table 2: Theme 1, subthemes and quotes: Motivators for initial engagement in a prehabilitation (prehab) for runners' workshop.

Theme	Subtheme	Quotes
1. Motivators for initial engagement in a prehab for runners workshop	Novelty of prehab	<p>"It was called "prehab", so I've done rehab, and it would be nice not to have the injury... (P19)."</p> <p>"Trying to get into running after a period of absence, and every time I have I found that it hurts, and it's stopping me from continuing, so I thought maybe if I learnt some methods of making it easier, I might keep at it (P20)."</p> <p>"I didn't know that even these kind of courses existed...(P7)</p>
	Constant cycle of injury	<p>"If you're overloading your body to make it stronger and fitter then it will hurt, but then I feel like it should hurt like that, but then I shouldn't have knee pain type thing... (P18)."</p> <p>"It should hurt because it's physical exercise but you should be able to protect yourself from injury...(P21)."</p>
	Running has become an unnatural activity	<p>"I think there is a kind of idea, an aspirational idea, that running, because of its simplicity should be simple and just natural and not, it'll just happen, and actually having to put some work in to it to make sure you don't injure yourself seems slightly counterintuitive (P6)."</p> <p>"I realised I did stuff like that when I was 10 (fast feet drills), with skipping and stuff... Latent for a very long time... (P5)."</p> <p>"It's like not natural anymore because everyone sits at a desk all day (P18)."</p>
	Opportunity to speak to someone.	<p>"I knew that doing some kind of strength training was a good thing...I'd been listening to podcasts and stuff and then everyone saying the gluts but I didn't really know (P11)."</p> <p>"It's useful [the internet], it gives you a global thing but you really need somebody there (P16)."</p> <p>"They (internet videos) don't look at "you" do they... they're addressing a generality and they might be wrong... you also self-diagnose (P21)."</p> <p>"You don't get that with video stuff so you are still dependent at some stage for somebody correcting you... so I don't think I would use them (videos) in isolation (P1)."</p>
	Running longevity	<p>"I was just thinking I am trying to find something else that would keep me going for longer (P1)."</p>

Table 3: Theme 2, subthemes and quotes: Developing awareness and perceived understanding of injury prevention.

Theme	Subtheme	Quotes
2. Developing awareness and perceived understanding of injury prevention	Familiarity with some concepts	<p>"I've bought enough shoes over the years at running shops to know about the pronation, supination, the cushioning... so that was reasonably familiar... the warm-up and cool down I "knew of" ... a brisk walk to the parkrun... (P6)."</p> <p>"My knowledge was very adhoc...what I'd picked up from [physios] and from the internet and speaking to people (P16)."</p>
	Perception running cues help	<p>"I tried that for my last run I did (high heels). It made a real difference. You feel yourself going quicker, just easier; it gets your legs up, your feet up (P7)."</p> <p>"When you sort of said (cadence), its makes sense in terms of what I think about cycling (P8)."</p>
	Specificity of exercises	<p>"I mean I don't go to the gym, so this has given me good exercises, some which I've never heard of before (P9)."</p> <p>"I'd probably do some squats or something, you know, that was kind of my idea of strength training or conditioning (P11)."</p> <p>"Probably I think all the problems I've had have been because I was too weak. But it's just about being more conscious about it. Not just learning, but also feeling exactly how many muscles there is in there, not just the big one [Gluteus Maximus] (P14)."</p> <p>"For me the biggest thing was one of the really simple exercises, which was like a single leg part squat. I found that really useful (P19)."</p>
	Monitoring pain and load	<p>"It was the sheet you gave us today...if you did have an injury then you could at least go back to the earlier versions of that [exercise]... (P1)."</p> <p>"The bad injury I got, I had been coming back from a flu like illness... and went straight into it, running with a club... (P5)."</p>
	Awareness of neuromuscular facilitation	<p>"I never thought my balance was that rubbish (P2)."</p> <p>"Everything to do with like neuromuscular facilitation. I just found I didn't know how that worked to teach your body how to do things in different positions without it being like heavy weights (P18)."</p> <p>"I'm someone new to running and I find the whole thing amazingly interesting to learn, because you know, you are completely learning a new relationship to your body (P21)."</p>

Table 4: Theme 3, subthemes and quotes: Empowerment for supported delivery of injury prevention.

Theme	Subtheme	Quotes
3. Empowerment for supported delivery of injury prevention	Supervision	<p>“Knowing that I think I know how to do them, rather than doing something online and not knowing if I’m doing it right. Because that was a barrier for me before (P10)”</p> <p>”You don’t have that interaction at all (in other exercise classes), they are just in their own zone (P8)”.</p> <p>“Somebody taking [the workshop] then, is encouraging. I don’t think I could get encouragement from the internet (P5).”</p>
	Group size	<p>“It’s a team effort... obviously you’re putting something in, you do it, and then you take that feedback, and something you adapt based on that what’s going on in the class, and within the group (P8).”</p> <p>“You certainly felt that if you didn’t turn up you would be missed because there was enough of us to know who we are now (P5).”</p> <p>“Because we’re a small group...you feel ok asking...if there was a class of 30 people then we wouldn’t have time to have those little chats in between (P11).”</p>
	Length of workshop	<p>“You kind of think you are doing this for 4 weeks... If it had have been for more weeks I think the temptation would have been to miss them some (P5).”</p> <p>“I think for me as well was the repeated elements... we get to meet you 4 times and practice something in the week in between and then come back... and discuss (P11).”</p>
	Holistic approach	<p>“I’m going to cherry pick the bits that actually matter to me. The rest of it, it’s very nice to know, it might be useful in the future... (P16).”</p> <p>“I liked that there were levels which you could do... you could continue to advance your exercises...and also if you injured yourself or something, you could go back to, and having bits of paper that say that so I can go back to them, and pdfs as well I can say I found very useful (P20).”</p>
	Structured approach	<p>“I think building up from an easy base every week is very helpful. Like, everyone was at different levels for different exercises so if you just chuck everyone in at a difficult level then if you can’t do it necessarily then you might not ever do it again. (P13).”</p> <p>“I think I might stick to this more is because there is more variety, so I may not do exactly ... 3 times a week but there will be something to pick from... (P14).”</p>
	Positive changes	<p>“My knees were injured, and not very strong, and I can actually feel them much stronger. It has made a huge difference to me (P2).”</p> <p>“The fact that there was no judgement at all about anybody’s ability or capability or anything like that. That helped. You weren’t trying to prove anything, you were just trying to get better (P1).”</p>
	Supporting literature	<p>“I find it really interesting what you said about the sports science behind the advice, and the research... (P4).”</p> <p>“It helped us understand why we were doing things which motivates you to do them (P20).”</p> <p>“Getting the pdfs by email was very useful (P22)”</p>
	Prehab is convenient	<p>“I’d always gone for these exercises after I’d had an injury, so the idea of doing these exercises before you have an injury, can be useful and can help (P12)”</p> <p>”Yes, it’s the tool that’s here to help me (P8).”</p>
	Responsibility for prehab	<p>“I think the reality is you get out of it what you put in don’t you (P1).”</p> <p>“There’s nothing I can’t do myself now that I have it all. It’s completely my problem if I don’t do it (P18).”</p>

Table 5: Theme 4 subthemes and quotes: Barriers to prehab.

Theme	Subtheme	Quotes
4. Barriers to prehab	Volume of information	<p>“This was probably more time consuming than I was expecting, which is probably why I’ve not been doing anything like it previously... (P13).”</p> <p>“There was definitely a lot every week, but I think the benefit of that was you could pick and choose what helps you (P18).”</p> <p>“Sometimes I’ve like left it to the end of the week before I go through... the ones I feel I should be working on, so I probably just need to ... put a bit more work in...(P18).”</p>
	Equipment	<p>“One thing that kind of delayed me a little bit was equipment (P19).”</p>
	Time management	<p>“I think with marathon training you run so many times a week and its quite time consuming. You’re whacking off the miles so it’s the time question (P15).”</p> <p>“Laziness.... but basically, it’s your own psychology isn’t it whether you continue or not (P16).”</p> <p>“I think it’s how people fit things like that is personal to everyone... (P18).”</p>
	When should prehab take place	<p>“I was worried I wouldn’t be able to do any of it because I’ve got an injury at the moment, but actually it showed me that you can still do most things but just adapt... (P13).”</p> <p>“I’m equipped enough, I think it’s just up to me to get it into a routine, but that’s about me... I do something before I go out for a run... (P14).”</p> <p>“There could have been space to talk about motivation rather than being told to do it yourself (P18).”</p>
	Forgetting exercise	<p>“Videos of the exercises... or you could google them... They’re fine if I’ve done them, but if I don’t do them regularly, you think “what was that one (P3).”</p> <p>“It’s sort of muscle memory if you do them regularly (P1).”</p>
	Peer influence/supervision	<p>“It’s the thing about running is, the loneliness of the long-distance runner, trying to motivate yourself that I find very difficult (P5).”</p> <p>“I would probably come back again for a refresher (P12).”</p>

