Fears and beliefs about running in adults with chronic low back pain: a mixed methods study from the ASTEROID randomised controlled trial

Sports Medicine - Open

ORIGINAL RESEARCH ARTICLE

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Fears and beliefs about running in adults with chronic low back pain: a mixed methods study from the ASTEROID randomised controlled trial

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Abstract

Background The stigma that running is unsafe for people with chronic low back pain (LBP) persists, despite recent studies showing that running training is feasible and beneficial in chronic LBP. We examined the beliefs about running in adults with chronic LBP.

Methods Forty adults (20 female, mean [SD] age 33 [6] years) with non-specific chronic LBP were randomised to a 12 week digitally-delivered run-walk interval training intervention or waitlist control (ACTRN12622001276741). Participants completed the activity specific beliefs questionnaire (4-point Likert scale) and recorded pain intensity at baseline and 12 weeks. Running intervention participants (n = 19) completed semi-structured qualitative interviews at 12 weeks.

Results Prior to randomisation, 10 participants (25%; intervention: n = 6) reported that running was unsafe. At follow-up, greater mean improvements were seen in the intervention group in the belief that running is safe. Specifically, belief in the safety of running on gravel (β [95%CI] 0.52[0.20, 0.84] points, P = 0.001), pavement (β [95%CI] 0.54[0.18, 0.89] points, P = 0.003), treadmill (β [95%CI] 0.49[0.14, 0.84] points, P = 0.006), and sprinting (β [95%CI]: 0.56[0.06, 1.06] points, P = 0.029) improved more than in the control group. Reflexive thematic analysis identified four themes: (a) fear and concerns that running may increase pain or lead to an injury, (b) negative beliefs are influenced by healthcare professionals and past experience, (c) fears can be overcome and be replaced with new beliefs, and (d) positive experience drives change in beliefs.

Conclusions Completing a 12 week run-walk interval training intervention led to more positive beliefs about running in adults with chronic LBP. The identified themes can assist clinicians in addressing barriers and facilitators to implementing running interventions for chronic LBP.

Trial registration: Australian New Zealand Clinical Trials Registry: ACTRN12622001276741. Registered on 29 September 2022.

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Key Points

- This study showed that at baseline, one-quarter of individuals with chronic low back pain reported running as unsafe, while most held minor fears or concerns about running.
- Negative beliefs about running were informed by past experience and healthcare professionals.
- Completing a 12 week run-walk interval training program led to more positive beliefs about running in adults with chronic low back pain.

Keywords Exercise training, Physical activity, Jogging, Interval training, Safety

Introduction

Low back pain (LBP) affects over 619 million people worldwide and is the leading cause of years lived with a disability [1]. Although up to 75% of new LBP cases resolve within 12 weeks, 25–33% of individuals continue to experience pain and disability 1 year later [2]. Chronic LBP (i.e. pain lasting ≥ 3 months) has a poor prognosis, with higher levels of disability, reduced physical activity and poorer aerobic fitness compared to healthy controls [3–5]. In a cross-sectional study of 1588 twins, only 55% of adults with chronic LBP (n = 442) met the World Health Organisation physical activity guidelines [6] of 150–300 min per week of moderate intensity physical activity and two days of muscle-strengthening exercise, and they were less likely to meet the guidelines than non-LBP controls [7]. Despite the association between chronic pain and increased risk of chronic disease [8], exercise interventions for individuals with chronic LBP are rarely sufficiently dosed to meet physical activity guidelines [9]. Prioritising exercise training for individuals with chronic LBP that can be dosed appropriately to reduce pain intensity while also addressing comorbidities associated with the condition is essential.

Running has been proposed as an inexpensive and highly accessible form of aerobic physical activity and is associated with healthier spinal tissue and lower rates of LBP [10, 11]. Previous randomised controlled trials have demonstrated that interventions involving running have resulted in within-group reductions in pain intensity in adults with chronic LBP (n = 10 [12] and n = 47 [13]). We have also shown that a 12 week run-walk interval training program reduced pain intensity and disability in adults aged 18–45 years with chronic LBP (n = 40) compared to control [14]. Additionally, the program was safe and feasible with 70% adherence to the intervention and no study-related serious adverse events. These studies support the use of running training as a safe physical activity option for adults with chronic LBP; however, the perceived safety of running from the patient perspective remains unclear.

There is evidence, albeit limited, of potential stigma among individuals with chronic LBP that running is unsafe compared to lower-impact physical activities such as swimming and cycling [15]. This belief may in part stem from the predominant biomedical view of LBP within the general population, where the spine is considered a vulnerable structure needing protection [16, 17]. Despite recommendations to stay active and return to normal activities as soon as possible following a new onset of LBP [18], there is a prevailing belief that resting and avoiding dangerous activities are necessary for recovery [16, 19]. Likewise, approximately 50% of adults with chronic musculoskeletal pain experience significant fear of movement [20–22], which is associated with lower rates of physical activity [23].

The perceptions of safety of running in individuals with LBP and how these beliefs affect participation in running have not been studied. When considering running and knee joint health, almost 40% of the general public consider running detrimental to knee joint health or are unsure [24], despite evidence that long-term exposure to running is safe for knee joint cartilage [25]. Additionally, beliefs about exercise in individuals with chronic LBP are influenced by factors such as exercise technique and load [26]. It is unclear if individuals with LBP hold similar beliefs about running. Addressing limitations within the existing evidence by providing a better understanding of running-related beliefs will assist healthcare professionals to support patients to participate in evidence based physical activity recommendations in patients with chronic LBP. Additionally, this knowledge will inform the design of future studies on running interventions in individuals with chronic LBP. The current study aims to examine the beliefs about running in adults with chronic LBP and assess whether these beliefs change following a 12-week running program.

Methods

Trial design

This pre-planned mixed methods exploratory study examined participant beliefs about running prior to and following a 12 week run-walk interval training program compared to waitlist control in adults (n = 40) with non-specific chronic LBP. The study was prospectively registered including this pre-planned analysis (ACTRN12622001276741) and its protocol is described in detail elsewhere [27]. In brief, participants assigned to the intervention were prescribed three self-directed 30 min run-walk training sessions per week for 12 weeks. Data were collected at Imaging @ Olympic Park (Melbourne, Australia) between 1 December 2022 and 16 May 2023, whereby all participants completed questionnaires at baseline and 12 week follow up using REDCap (Nashville, United States of America). Additionally, intervention participants completed semi-structured qualitative interviews at 12 week follow up. Ethics approval was granted by Deakin University Human Research Ethics Committee (ID: 2022–162) on 26 September 2022. Participants provided written informed consent prior to participating in the study, which was conducted in line with the Declaration of Helsinki. The study adhered to the Consolidated Standards of Reporting Trials (CONSORT) Statement [28] (Supplemental File 1), with qualitative aspects reported according to the Standards for Reporting Qualitative Research [29] (Supplemental File 2).

Participants

Adults aged 18–45 years with non-specific chronic LBP (≥ 3 months; experienced on most days in an average week, with or without leg pain) were recruited from the Melbourne metropolitan region via web-based advertising between October 2022 to January 2023 [27]. Participants who registered their interest through the study website were screened by telephone to determine eligibility. Exclusion criteria were: (a) specific or non-musculoskeletal causes of LBP (e.g. fracture, cauda equina syndrome, infection), (b) symptomatic radiculopathy, (c) inability to communicate in English, (d) pregnant or within one year postnatal, (e) current or former elite athlete (e.g. member of Australian Institute of Sport, State Institutes or Academies of Sport or the national squad of any sport) [30], (f) any absolute contraindications for magnetic resonance imaging, (g) participation in running or running-related sports in the past three months (> 1 session per month), (h) having experienced a lower limb injury in the past six weeks, (i) any absolute contraindications for exercise training or deemed higher risk of adverse event during physical activity according to the Adult Pre-Exercise Screening System [31], and (j) unable to access or operate a smartphone with a cellular internet connection.

Interventions

Exercise training and education

Participants randomised to exercise training were prescribed three 30 min exercise training sessions per week for 12 weeks (36 total sessions) by an accredited (Exercise and Sports Science Australia) exercise physiologist from the research team (CN and CLS) [27]. The exercise program consisted of run-walk interval training, where participants alternated between short running intervals and periods of walking. Participants self-selected between 6 and 10 repeats per session, starting with intervals of 15–45 s of running and 115–120 s of walking, determined by their tolerance to a two-minute run test at baseline. Participants progressed to the next stage (maximum one stage per week) if they could complete the upper repeat range (i.e. ten repeats) and completed at least two training sessions that week. Running intervals increased by 15 s at each successive stage and walking intervals remained constant or reduced by 15 s. Using a running app (Runkeeper, v14.7, ASICS Runner App, Boston, United States of America) as guidance, participants were advised to aim to jog at a pace of 10 km/h during the running portion of the training session and to walk at a self-selected pace between each bout. Additionally, participants were advised to complete training sessions on a flat track without significant hills. The participants received support and guidance during brief 10–15 min secure video consultations (Zoom Video Communications, California, United States of America), weekly (weeks 1–4) and fortnightly (weeks 6–12). Additionally, participants received educational content via email during weeks 1–4 covering the following topics: (a) ideal running speed, (b) footwear selection, (c) the safety of running, and (d) dealing with setbacks (Supplemental File 3). In addition to the intervention, participants could manage their LBP as usual (e.g. general practitioner management, over-the-counter pharmacotherapy) and engage in other physical activity if desired.

Waitlist control

Participants randomised to control were asked to manage their LBP as usual (e.g. general practitioner management, over-the-counter pharmacotherapy) and avoid commencing a running program [27]. Otherwise, no restrictions on physical activity were imposed. Following completion of the study, waitlist participants

were offered the same exercise training program as per the intervention group.

Outcomes

All participants completed questionnaires prior to randomisation at baseline and at 12 week follow up. Intervention participants completed semi-structured qualitative interviews at 12 week follow up.

Activity specific beliefs

The activity specific beliefs questionnaire was created to measure participant beliefs of safety concerning six variations of running and walking on different surfaces (e.g. flat, up-hill, pavement) and at different speeds (e.g. jogging, sprinting; Supplemental File 4). For each variation, participants were asked 'Do you think the following exercises/movements are safe for you to do?' Responses were rated on a four-point Likert-type scale ranging from definitely no, probably no, probably yes and definitely yes, with scores ranging from 1, 2, 3 and 4, respectively. Participants were shown the activity via a 10–15 s video prior to responding. For each activity perceived as unsafe (responses of definitely no and probably no), participants were presented with three additional questions: (a) 'What aspects of this exercise/movement do you feel are unsafe?', (b) 'What do you think will happen if you did [this activity]?', and (c) 'Do you limit how much of this exercise/movement you do because it may be unsafe?' Questions were developed by the authors based on the Fear of Daily Activities Questionnaire [32] and the Tampa Scale of Kinesiophobia [33] and tested by 10 consumers with LBP who completed the questionnaire and provided feedback regarding user experience. Minor changes were made to the questionnaire wording following consumer feedback to enhance participant readability. To aid interpretation, responses to the question 'Do you think the following exercises/movements are safe for you to do?' were dichotomised to 'safe' or 'unsafe' responses when presented descriptively.

Pain intensity

Current, average and worst LBP intensity were measured on a 100-point visual analogue scale with endpoints representing "no pain" (0 points) and "worst pain imaginable" (100 points) [34]. Average and worst LBP intensity were based on participant recall over the last seven days. The visual analogue scale demonstrates excellent test–retest reliability when measuring pain intensity (ICC = 0.90) [35].

Disability

Self-reported disability due to LBP was measured using the Oswestry Disability Index [36]. Ten questions are rated from 0–5 points, with higher scores indicating greater disability due to LBP. The total score (0–50 points) is doubled and represented as a score out of 100. The Oswestry Disability Index has good to excellent test–retest reliability (ICC = 0.84–0.94) [36].

Semi-structured interviews

Intervention participants completed semi-structured interviews at 12 weeks follow up that centred around two key topics: (a) feasibility of the 12 week running program and (b) participant beliefs of safety about running (Supplemental File 5). This study focused on responses to the questions pertaining to participant beliefs, such as 'Do you think running is safe for people with low back pain?', 'Did you have any fears or concerns before starting the program?' and 'Have your feelings towards running changed since before the program?'. Interviews were conducted by CN and CLS in a private room at Imaging @ Olympic Park and audio recorded using an iPad (Apple Inc., California, United States of America).

Thematic analysis

Coding and analysis of qualitative interviews were guided by Braun and Clarke [37] guidelines for 'reflexive' thematic analysis, which includes six phases: (a) familiarisation, (b) coding, (c) generating initial themes, (d) developing and reviewing themes, (e) refining, defining and naming themes, and (f) writing up. Given the interviewers' (CN and CLS) and coder's (CN) backgrounds as accredited exercise physiologists, this approach was chosen to allow a rich and meaningful interpretation of the data that can inform clinical practice. The approach considers the skills and background of the researcher as an integral part of the process and therefore, multiple coders are not necessary (or even desired) to ensure quality [38]. Prior to the interviews, CN and CLS discussed how their backgrounds may influence reflexivity throughout the thematic analysis. This included acknowledging their lifelong involvement in sports and recreational running, their roles as coaches of participants during the intervention, and their professional identities as accredited exercise physiologists.

The thematic analysis was grounded in a realist framework and took an inductive 'bottom-up' approach driven by the research question and grounded in the data. While previous qualitative research [39, 40] has explored individual beliefs about exercise, no studies have addressed how individuals with LBP perceive the task of running. Given the unique nature of this research question, an inductive approach was chosen

to avoid confining this analysis to what was already known about exercise-based beliefs. Coding predominantly focussed on the semantic meaning of participant language (i.e. surface, obvious, overt) as opposed to drawing on a latent or underlying meaning. Quality was addressed throughout to ensure a rigorous, deliberate and reflexive process by following the Braun and Clarke 20-question guide to assessment of thematic analysis research quality [38]. To ensure trustworthiness of the data, both qualitative and quantitative data relating to participant beliefs were collected. Member checking was not performed.

Audio from each interview was transcribed verbatim using Rev transcription services (Rev.com Inc., Texas, United States of America) and checked for accuracy by comparing audio recordings to text files prior to coding (CN). Data familiarisation included reading and listening to each transcript three times, with an average of five days between subsequent readings to provide space to consider the key aspects of the interview. During these readings, notes were taken to capture initial points of interest. Coding of transcribed interviews was undertaken once all interviews were completed. This involved identifying and labelling potential points of interest within the transcripts. Codes were refined and added to over multiple sweeps as each additional interview was reviewed in differing order. Each stage of coding and theme development was documented using NVivo (v14.23.0, QSR International, Massachusetts, United States of America) to ensure the process was traceable and demonstrated academic rigour. Once initial coding was complete, codes were grouped into themes that identified patterns of shared meaning within the data [37]. Themes and sub-themes were visualised and refined using the concept map function in NVivo. Quotations were then added to the analysis to represent the themes and provide rich examples. The inclusion of quotations involved re-reading the transcripts in context to ensure they were represented accurately. Participant names were substituted with individual study codes during the analysis, and pseudonyms, age and sex were included in the results to add context to each quotation [41].

Sample size

The sample size of 40 participants (n = 20 per group) was based on a priori statistical power calculations and adjustment for attrition to detect between-group net differences in the primary outcomes of the larger study (pain intensity, disability and intervertebral disc T2) [27]. For thematic analysis, a purposive sample of 20 participants from the exercise training group was selected a priori to ensure the results reflected the entire sample of participants undertaking the running intervention [42]. One intervention participant only completed five training sessions (during the first 5 weeks) due to personal reasons (bereavement), and chose not to attend the semi-structured interview.

Statistical methods

All statistical analyses were conducted using Stata (v17, StataCorp, College Station, United States of America). Separate linear mixed models with random effects (participants) were used to evaluate within- and between-group (intervention and control) changes in beliefs about running over time. All linear mixed models employed restricted maximum likelihood estimations and adopted an intention-to-treat approach [43]. Likert-type scales were treated as continuous data for linear mixed models [44]. An α of 0.05 was adopted for all analyses.

Results

Participant flow

Participant flow is outlined in Fig. 1. Out of 155 individuals screened for eligibility, 94 (60.6%) did not meet the inclusion criteria, 21 declined to participate and 40 (female: n = 20; male: n = 20) were randomised to the exercise intervention or waitlist control. No participants withdrew from the study. The trial ended once all enrolled participants completed the 12 week follow up.

Baseline data

The descriptive characteristics of participants are outlined in Table 1. Among the total sample, mean (SD) age at baseline was 32.8 (6.2) years, low back pain intensity (average over last seven days) was 39.7 (21.1) points and disability was 22.0 (9.1) points. Fewer than half (45%) reported having previously run for fitness and among those that did, the longest (median [IQR]) they had previously run continuously in a single session was 9.0 (5.0, 14.3) km. Caucasian (82.5%) was the most reported ethnicity, followed by Asian (12.5%), Indian (5%) and Middle Eastern (5%).

Beliefs about running and walking at baseline

At baseline, ten participants (25%; intervention: n = 6, control: n = 4) reported at least one running activity as unsafe, and all ten of these participants selected that they limit how much running (in context to surface or speed) they do because it may be unsafe. The running activities most reported as unsafe were sprinting (22.5%), followed by running/jogging on the pavement (15%), running/jogging uphill (10%) and running/jogging on a flat gravel

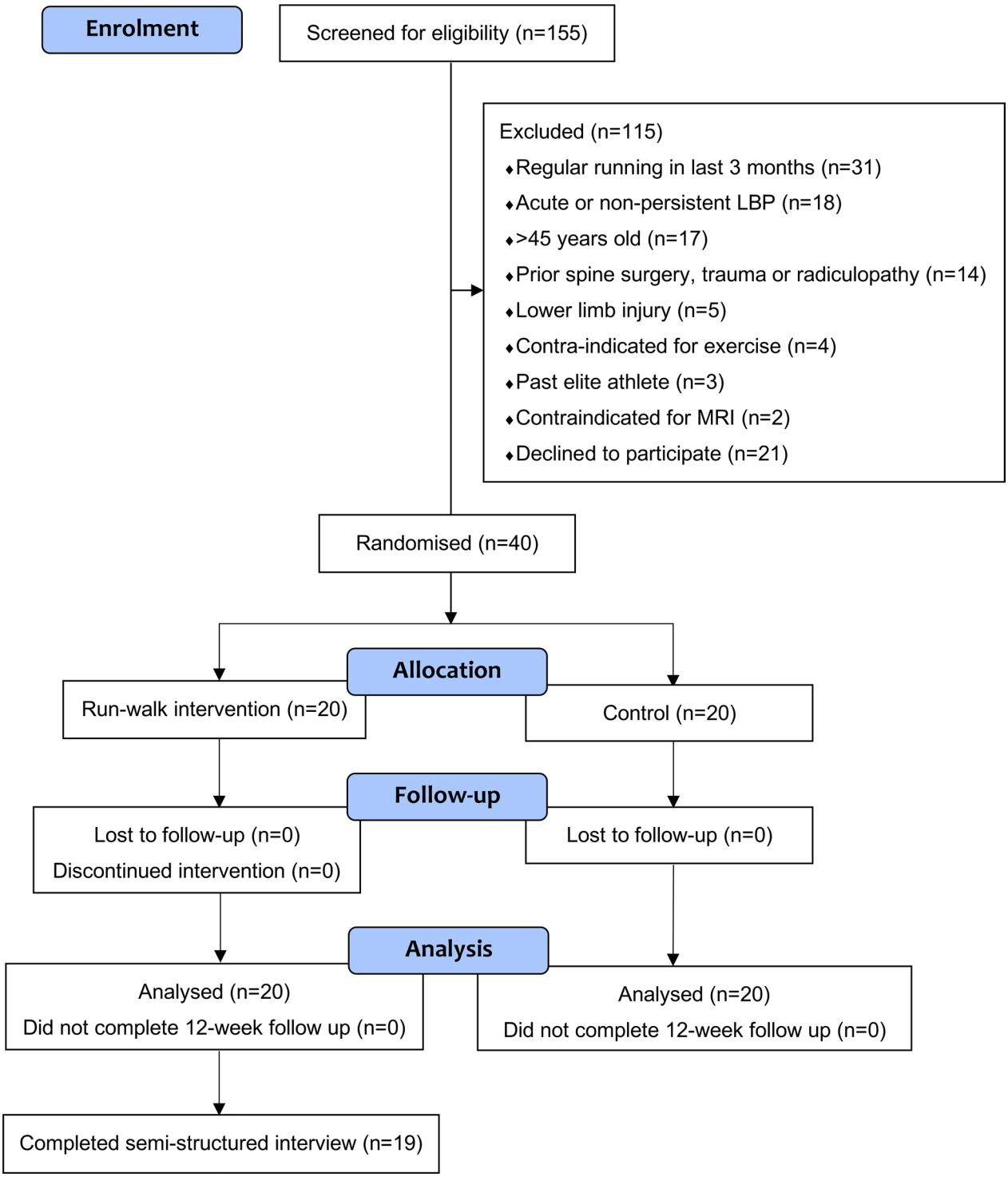

Fig. 1 CONSORT participant flow diagram. *MRI* magnetic resonance imaging, *LBP* lower back pain

surface or treadmill (both 5%). No participants reported walking as unsafe. The most reported aspects of running that participants believed to be unsafe related to ground impact forces, flexion and extension of the spine and high-speed movements (Table 2). The most perceived consequence of running by those who reported at least one form of running to be unsafe was increased pain (54.8%), followed by difficulties completing activities

Table 1 Descriptive characteristics of participants

	Intervention (n = 20)	Control (n = 20)
Age, years	33.6 (5.3)	32.2 (7.0)
Female, n (%)	10 (50)	10 (50)
Pain, visual analogue scale (0–100)		
Current	30.8 (23.3)	40.1 (20.9)
Average[a]	33.5 (20.6)	46.0 (20.1)
Worst[a]	50.6 (22.5)	65.9 (17.9)
Disability, oswestry disability index (0–100)	20.8 (8.5)	23.1 (9.7)
Low back pain duration, years[b]	3.2 (2.8)	4.9 (5.8)
Body mass index, kg/m^2	29.6 (6.9)	29.0 (7.5)

Data are mean (SD) or count (percentage within-group)

[a] Average and worst low back pain intensity over the last 7 days

[b] Duration since onset of current episode of low back pain

Table 2 Aspects of running that participants reported as unsafe prior to randomisation into a 12 week run-walk interval training program or control

Activity	What aspects of this exercise/movement do you feel are unsafe?	Number of participants reporting this activity as unsafe
Sprinting	"The impact from the ground up my legs to my back'	9
	'Increased stiffness"	
	"High impact"	
	"Quick movements"	
	"Jarring of the spine"	
	"Sharp pain"	
	"Same as other running. Ok for a bit but causes additional tightness and pain"	
Running/jogging on pavement	"The impact of my leg on concrete"	6
	"Repetitive impact"	
	"Back extension"	
	"More impact on harder surfaces"	
	"Impact can aggravate my pain"	
Running/jogging uphill	"Running uphill causes back pain, possibly because I need to bend forwards while legs impact ground"	4
	"Uphill strain"	
Running/jogging on a treadmill	"Back extension"	2
Running/jogging on flat gravel	"Back extending"	2

of daily living (23.8%), a back injury (11.9%) or injury of another body part (9.5%).

Outcomes and estimation

Changes in participant beliefs about running and walking are presented in Table 3. At 12 weeks, between-group differences favouring the intervention group (i.e. greater belief that running is safe) were detected for the belief of safety about running/jogging on gravel, running/jogging on the pavement, running/jogging on a treadmill and sprinting. No between-group differences were detected for the belief of safety about running/jogging uphill or walking.

Thematic analysis

Four themes and four sub-themes regarding beliefs about running were identified from the semi-structured interviews. Themes were: (a) fear and concerns that running may increase pain or lead to an injury, (b) negative beliefs develop from healthcare professionals and past experience, (c) fears can be overcome and be replaced with new beliefs, and (d) positive experience drives change in beliefs.

Table 3 Changes in beliefs about running and walking over time based on responses to the activity specific beliefs questionnaire

Variable	Intervention (n = 20)			Control (n = 20)			Group-by-time	
	Mean (SE)	Δ Mean (95% CI)	P	Mean (SE)	Δ Mean (95% CI)	P	β (95% CI)	P
Sprinting								
Baseline	3.01 (0.18)			3.14 (0.18)				
12-week	3.51 (0.18)	0.50 (0.15, 0.85)	**0.006**	3.08 (0.18)	− 0.06 (− 0.41, 0.30)	0.748	0.56 (0.06, 1.06)	**0.029**
Running, pavement								
Baseline	3.33 (0.16)			3.37 (0.16)				
12-week	3.73 (0.16)	0.40 (0.15, 0.65)	**0.002**	3.23 (0.16)	− 0.14 (− 0.39, 0.11)	0.283	0.54 (0.18, 0.89)	**0.003**
Running, uphill								
Baseline	3.40 (0.16)			3.25 (0.16)				
12-week	3.60 (0.16)	0.20 (-0.07, 0.47)	0.141	3.26 (0.15)	0.01 (− 0.26, 0.28)	0.921	0.19 (− 0.19, 0.57)	0.335
Running, treadmill								
Baseline	3.57 (0.12)			3.58 (0.12)				
12-week	3.92 (0.12)	0.35 (0.10, 0.60)	**0.005**	3.44 (0.12)	− 0.14 (− 0.39, 0.11)	0.268	0.49 (0.14, 0.84)	**0.006**
Running, flat gravel								
Baseline	3.46 (0.13)			3.39 (0.13)				
12-week	3.91 (0.13)	0.45 (0.23, 0.67)	**< 0.001**	3.32 (0.13)	− 0.07 (− 0.30, 0.16)	0.536	0.52 (0.20, 0.84)	**0.001**
Walking								
Baseline	3.99 (0.05)			3.86 (0.05)				
12 week	3.99 (0.05)	0.08 (− 0.06, 0.21)	0.259	3.91 (0.05)	0.05 (− 0.02, 0.12)	0.135	− 0.05 (− 0.15, 0.05)	0.287

Data are sample size, estimated marginal mean (SE), within-group mean change (Δ) from baseline (95% CI), within-group P-value, group-by-time β coefficient (95% CI) and group-by-time P-value from linear mixed models. Significant within- and between-group interactions are indicated in bold type. Mean scores range from zero (definitely not safe) to four (definitely safe)

Theme one: Fear that running may increase pain or lead to an injury.

Most intervention participants (over two-thirds) recalled that prior to starting the program, they had some fear or concern that running would increase their back pain or lead to injury. When asked to elaborate on these fears, participants responded with:

> *"Fears about whether or not I'd be able to do it consistently enough and follow it through, concerns about injuring myself further." – Dan, male, 32*
> *"Yeah, I was a little bit worried that my back would just flare up and be like, 'Yeah. This ain't going to work for you,' I suppose." – Harry, male, 35*

Although many participants expressed a belief that running may be unsafe, the extent to which they held this belief varied. While some mentioned it as a minor fear or concern, others expressed that they did not consider it a fear but rather a sense of uncertainty about running.

> *"I guess there's a very small concern or fear that you could make the back pain worse." – A.J., male, 31*
> *"Yeah, I probably wondered. I wouldn't call it a fear, but I wondered whether it would make it worse" – Grace, female, 34*

Fears and concerns about the impact of running and the stress it imparts on the body were often reported, with a number of participants citing concerns relating to running on harder surfaces.

> *"I've been told the run is not good for your lower back. The impact is not good, so I got really worried about it. And I used to walk a lot. I used to exercise but not running." – Lev, male, 39*
> *"I've definitely heard people say before that running, especially on hard surfaces like concrete, can cause issues with back pain or impact loading, that kind of thing." – A.J., male, 31*

Further, participants who reported concerns around running surface often compared running to physical activity with lower ground-impact forces, suggesting the latter is safer for your back.

> *"Walking or gentle things, swimming, that kind of thing, or cycling maybe even, have been things I've been encouraged to do. But running has certainly been something that I've been told to avoid, and therefore have avoided it, and was certainly concerned based on that." – Dan, male, 32*
> *"I would've imagined that a lower load bearing exercise like swimming or something, where you're not*

actively jarring your back as you perform the exercise, I thought something like that would be more beneficial." – Oscar, male, 31

Theme two: negative beliefs develop from healthcare professionals and past experience

Sub-theme: what I have been told—healthcare professionals Participants cited that their fears and concerns about running were primarily informed based on information received by healthcare professionals. In particular, advice from healthcare professionals on the risks of running, either explicitly or implicitly, was reported as informing their beliefs about running.

"I reckon it's the professionals out there that I've seen, physios, chiros, and an osteo in the past. I've also seen several back surgeons and even the GP and they say, 'When you are having a flare up, you need to rest.' So it's backwards to what this is." – Jennifer, female, 41

"I've seen a neurosurgeon for my back before and he's told me not to run. Just like osteos, physios have told me not to push it and I can do light jogging, but not to go into proper runs." – Amy, female, 26

One participant suggested the information received from spinal imaging impacted her beliefs and resulted in uncertainty surrounding what physical activity is safe:

"Well, when I had an x-ray soon after I hurt my back, they said there was a narrowing of the disc space, so I'm thinking anything that could impact that, I don't know, anything." – Molly, female, 31

Sub-theme: If it has happened before, it will happen again—past experience. Participants regularly cited the role of past experience with running and physical activity as shaping their beliefs about running. Painful experiences and those leading to increased disability appeared to have the strongest impact on creating negative beliefs about running. For example, when asked where fears of running have come from, some participants responded with:

"So past experience, definitely because of the sort of pain that I've had in the past while running." – Steve, male, 41

"No, past experience. Footy training, there'd be times where I'd be at footy training and then I'd kick a ball or I'd be running just to do something, and then I'd have to stand up straight. Oh, there's a big nasty spasm." – Charlie, male, 33

Theme three: fears can be overcome and be replaced with new beliefs

Sub-theme: a new mindset—running is (mostly) safe. When asked post-intervention if they think running is safe for people with low back pain, participants primarily reported that they now believe running is safe. Those who were initially fearful reported those beliefs have changed.

"Yeah. Safe. I think my belief around [running] has changed since the start of the program. I would've thought it would've aggravated my back more than it actually did. And now that I've done the program, I would say that it's definitely safe. In my case, it was safe." – Oscar, male 31

"Yes. I'm not fearful anymore." – Olivia, female, 38

Others reported that they believed running was safe for them but added that this may not apply to others with low back pain, particularly those with more severe conditions.

"I think so. Yeah. I mean, I think it obviously depends on what the back issue is, but for people that have just aches like I have and just discomfort, I for sure would say it seems safe. Yeah. And I would now recommend it." – Harry, male, 35

"I imagine there's some people that are [...] smashing painkillers daily just to do ordinary tasks. Whether it's safe for those sorts of people, I wouldn't have a clue." – Charlie, male, 33

In some cases, they noted that a program tailored to the individual or doing intervals of running and walking (per the current program) was necessary for running to be safe.

"To a degree, yeah. Certainly, I've got a few friends that have back issues and they think I'm mental for running, so I know that I wouldn't turn around and tell anyone to go and take up running unless it was like this. Because it's short, sharp bursts in between a walk and it just feels a lot safer than go and run for 20 minutes [continuous]." – Jennifer, female, 41

Sub-theme: this actually works – reducing back pain and recovering from 'flare-ups'. In addition to the belief that running is mostly safe, some participants identified running as an option to help reduce low back pain or recover quicker from an episode of increased pain.

"I feel that even on the days where I was quite uncomfortable after work, running eased it quite well, I think. It's almost like it loosened it up a lit-

tle bit or whatever. And I felt great afterwards. So yeah, it definitely changed my mind on it." – Harry, male, 35

"But I find that if I have that pain, if I go and sit down, it's worse. If I go for a walk or a run, it's better. And I would never have had that correlation before doing this program." – Jennifer, female, 41

Theme four: positive experience drives change in beliefs

The most common reason participants gave for changing their beliefs about running was doing the program and experiencing an absence of low back pain while running.

"From my experience right now, to be honest, it's safe. Because from my experience, I was expecting once I start running, I will feel lower back pain and that will stop me […] During my run, 100% I did not feel lower back pain, very strangely. I did not expect that." – Lev, male, 39

When asked what helped overcome their fears, Charlie (male, 33) replied: "*Just getting out and going, 'all right, let's just have a crack and see what happens,' knowing that the fears there, but still going through it anyway and just seeing what happens.*"

For Grace (female, 34), a positive experience with the running intervention has increased her confidence to return to running-based sport: *"I thought, 'Oh, I don't think I would ever go back to netball or basketball.' Six months ago I would've said, 'I'm done now,' but I could probably go back I think, now it's been tested."*

Discussion

Prior to completing a 12 week run-walk interval training program, some individuals with non-specific chronic LBP reported running as unsafe, with most holding minor fears or concerns of injury or pain exacerbation associated with participation in running. Among individuals who believed running was unsafe at baseline, all reported consequently limiting their running. These negative beliefs about running were primarily informed by advice received from healthcare professionals and past experience. However, undertaking a 12 week run-walk interval training program combined with education led to more positive beliefs of safety about running in the intervention group compared to control.

Baseline questionnaires showed that one-quarter of participants with chronic LBP who volunteered to participate in a running intervention thought running was unsafe, and among those, all reported limiting running because it may be unsafe. This study is the first to explore the beliefs of individuals with LBP about running. However, when considering running and knee joint health, a survey of 502 adult runners and non-runners showed that 13.1% considered running detrimental to knee joint health, while 25.9% were unsure [24]. Participants in the current study reported their primary concern was that running may increase pain intensity due to the ground impact forces, particularly when completed on hard surfaces (e.g. pavement) or at higher speeds (e.g. sprinting). However, these beliefs are not currently supported by the literature on running training; among the few published trials exploring running in adults with chronic LBP, none have reported an increase in average pain intensity or re-injury as a result of running training over three to 6 months [12–14]. Given the association between negative pain-related beliefs and reduced physical activity [45], understanding and addressing negative beliefs about running in individuals with chronic LBP may reduce activity avoidance and barriers to physical activity participation.

Qualitative interviews at 12 weeks showed that most intervention participants recalled having fears or concerns about running before commencing the intervention. However, these concerns were often reported as minor, which may account for the discrepancy between quantitative (perceived safety) and qualitative (fear of running) results. Additionally, given the differences in time points at which these data were collected (i.e. baseline and 12 weeks), recall bias may have impacted the results. Thematic analysis identified that the negative beliefs participants held about running were primarily formed based on past experience and information provided by healthcare professionals, which included advice to avoid running altogether or adopt caution when running. Similarly, qualitative interviews of 23 adults with acute and chronic LBP demonstrated that back pain beliefs were influenced mainly by healthcare professional advice, which often reinforced a state of vulnerability within the spine [46]. In a study of 1218 Italian physical therapists, over one-third believed that running was a risk factor for the onset of LBP [47]. Moreover, a systematic review including ten studies (participants: 786) found physiotherapists with higher fear avoidance scores were often more likely to advise patients to avoid returning to regular activity following a back injury [48]. Given the impact that healthcare advice can have on informing patient beliefs, clinicians should be mindful of how the information they provide to patients is received. Understanding healthcare professional beliefs about running will assist in identifying the need for evidence-based education and designing strategies to modify unhelpful beliefs.

Following the 12 week run-walk interval training program, questionnaire responses showed that compared to control, the intervention group held more positive beliefs about running at 12 weeks. Similarly, qualitative

interviews conducted with intervention participants after the program indicated that participants believed running was mostly safe, citing that an individualised, interval-based approach was important for increasing the safety of running. Intervention participants were provided with educational material via email covering the safety of running. However, participants reported that positive experiences with running during the intervention underpinned the change in beliefs. This may be due in part to expectancy violations, whereby being pain-free during the running intervention challenged the previous expectations of participants. Beliefs about running uphill were the only variation of running that did not differ between groups at follow up. This may be due to participants being advised to run on flat surfaces, resulting in limited exposure to uphill running. A mixed methods study of 113 participants with LBP found the personal experience of participants was integral for shaping beliefs about exercise training [26]. Based on prior literature [49], we employed a conservative program with modest weekly increases in running time to allow mastery of each running stage before progressing. Additionally, participants chose their preferred number of repeats each training session, allowing them to tailor the program to their comfort levels. By encouraging autonomy and shared decision making, this approach was designed to promote self-efficacy [50], which is a mediator of pain intensity in individuals with chronic pain [51]. A semi-individualised and conservative run-walk interval training program appears effective for safely exposing adults with chronic LBP to running and overcoming associated fears.

Strengths and limitations

This study provides novel insights into the fears and beliefs held by adults with chronic LBP about running. Our results are strengthened by including both qualitative and quantitative data to determine if participants believed running was unsafe and the reasons behind these beliefs. However, this study is not without limitations. Firstly, these results are specific to adults aged 18–45 with mild to moderate, non-specific chronic LBP who willingly signed up for a 12 week running intervention. While fewer than half reported having previously run for fitness, these participants likely held less fear about running than would be found in a more general sample of adults with LBP or those with severe pain. This was reflected in the high baseline scores on the activity specific beliefs questionnaire, indicating that, on average, participants perceived running as safe. Previous research found that non-runners are tenfold more likely to have negative beliefs about running and knee joint health than runners [24]. Additionally, it is unclear whether between-group differences in pain intensity or duration at baseline were meaningful or had any impact on results. Future research should explore participant beliefs about running in a larger, more representative cohort to provide greater confidence in generalising the current findings to the broader population. Secondly, given that the qualitative interviews were conducted following the 12-week program, there is a risk of recall bias in the data exploring participant beliefs prior to the intervention. While imposing an increased participant burden, conducting qualitative interviews both before and after the 12-week intervention may have provided more nuanced results. Thirdly, we designed the activity specific beliefs questionnaire to ascertain whether or not participants believed running and walking were safe, yet the responses were not directly tied to current LBP. For example, one participant noted that running on concrete was unsafe due to the lower limb impact and implications for ankle or knee pain, rather than LBP. Finally, as we created the activity specific beliefs questionnaire to address the aims of the current study, the validity and reliability of this tool warrant further investigation. Additionally, it is unclear if the between-group differences in participant beliefs observed represent a clinically meaningful change.

Conclusion

Prior to a 12 week run-walk interval training program, some individuals with chronic LBP held fears and concerns about running, particularly when performed on harder surfaces or at higher speed. Negative beliefs about running were often informed by advice from healthcare professionals and past experiences, which led to avoidance of physical activity. However, the experience of completing a run-walk interval training program led to more positive beliefs about running. In individuals with chronic LBP who hold negative beliefs about running, providing positive experiences via conservative, supported and graded running activity alongside education may help reduce activity avoidance and increase participation in guideline-based physical activity.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s40798-025-00861-6.

Supplementary material 1.
Supplementary material 2.
Supplementary material 3.
Supplementary material 4.
Supplementary material 5.

Acknowledgements
The authors thank the participants for taking part in the study and the broader ASTEROID research team for assisting in the conduct of the study.

Author contributions
CN contributed to data curation, formal analysis, investigation, project administration, software, visualisation and writing—original draft. CLS contributed to data curation and project administration. SDT contributed to conceptualisation and project administration. DLB and UHM contributed to conceptualisation and funding acquisition. PB, CTM and NLM contributed to supervision. DS contributed to funding acquisition and supervision. PJO contributed to conceptualisation, funding acquisition, investigation, project administration, resources, software, supervision, validation and visualisation. CN, CLS, SDT, DLB, PB, MJC, CTM, UHM, NLM, DS and PJO contributed to methodology and writing—review and editing. All authors read and approved the final version of the manuscript.

Funding
This work was supported by internal funding (Deakin University). DS is supported by a National Health and Medical Research Council Investigator Grant (GNT1174886). CN and CLS are supported by Australian Government Research Training Program (RTP) Scholarships. SDT is supported by a University of Melbourne Sir Randal Heymanson Fellowship. NLM is supported by a Deakin University Dean's Post-Doctoral Research Fellowship (salary).

Availability of data and materials
The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Code availability
The code used for data analysis in the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval
Ethics approval was provided by the Deakin University Human Research Ethics Committee (ID: 2022–162) on 26 September 2022.

Consent to participate
Participants provided written informed consent prior to participating in the study.

Consent for publication
Not applicable.

Competing interests
NLM is a non-executive director for the national board of Exercise and Sports Science Australia. None of the authors have any potential conflicts of interest with the content of this article.

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Received: 11 November 2024 Accepted: 29 April 2025
Published online: 08 June 2025

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