Clinical and exercise professional opinion of return-to-running readiness after childbirth: an international Delphi study and consensus statement

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ABSTRACT

Female athletes have identified a lack of guidance as a barrier to successfully returning to running postpartum, and existing guidelines are vague. Our aim was to define the current practice of determining postpartum run-readiness through a consensus survey of international clinicians and exercise professionals in postpartum exercise to assist clinicians and inform sport policy changes.

A three-round Delphi approach was used to gain international consensus from clinicians and exercise professionals on run-readiness postpartum. Professionals who work with postpartum runners participated in an online survey to answer open-ended questions about the following postpartum return-to-running topics: definitions (runner and postpartum), key biopsychosocial milestones that runners need to meet, recommended screening, timeline to initiate running, support items, education topics and factors that contribute to advising against running. Consensus was defined as ≥75% participant agreement.

One hundred and eighteen professionals participated in round I, 107 participated in round II (response rate 90.6%) and 95 participated in round III (response rate 80.5%). Responses indicated that, following a minimum 3-week period of rest and recovery, an individualised timeline and gradual return to running progression can be considered. Screening for medical and psychological concerns, current physical capacity, and prior training history is recommended prior to a return to running. This study proposes recommendations for the initial guidance on return-to-running postpartum, framed in the context of current research and consensus from professionals. Future research is needed to strengthen and validate specific recommendations and develop guidelines for best practice when returning-to-running after childbirth.

INTRODUCTION

Females experience key transitions across the lifespan—including puberty, pregnancy and menopause—where significant changes in hormones and body morphology may influence exercise participation and performance.[1–3] The perinatal period is one such transition that profoundly affects a female's physiology and biomechanics, with lasting implications that may challenge future exercise participation.[4–6] Running is a popular form of exercise for the perinatal population,[7–10] but a recent study reported only 31% of pregnant or postpartum runners received advice on returning to running after childbirth.[11] As a result, runners often self-determine how to continue running during and after pregnancy, and approximately 46% of runners stop running during pregnancy and 25% do not return-to-running after childbirth.[12] This lack of information on safe participation in running during the perinatal period is a significant barrier to gender and sex equity in sports.[13]

After major surgery or injury, most athletes undergo rehabilitation before returning to sport. During rehabilitation, the athlete must meet key milestones to progress through rehabilitation stages and, at a minimum, be screened for mental and physical readiness to fully participate in sport.[14 15] A similar approach has been proposed for return-to-running postpartum[16–19] but the high-quality evidence needed to confirm and optimise these approaches is still lacking. Due to this lack of evidence, runners and the clinicians who work with them have to rely on expert opinion, which extrapolates findings from the general research on return-to-sport (ie, following an athletic injury), postpartum populations (non-athletes) and running-related injury (RRI) research.[16–22] While the existing frameworks have many similarities, there are some conflicting theories (ie, timeline for return). Therefore, the current study employed a Delphi technique to determine consensus from many experienced clinical and exercise professionals on current practice of determining run-readiness after childbirth. Expert opinion consensus on the rehabilitation programme and running programme design is presented in another publication.[23]

METHODS

The Delphi technique (three rounds)—which is commonly used for decision making and forecasting studies—was used to determine consensus of clinical and exercise professionals on postpartum return-to-run topics.[24–31] Experienced professionals (respondent group) were asked their opinion on key musculoskeletal assessments, milestones and screening that should be used when determining run-readiness postpartum.

Participants

The respondent group were experienced professionals recruited through personal networks, social

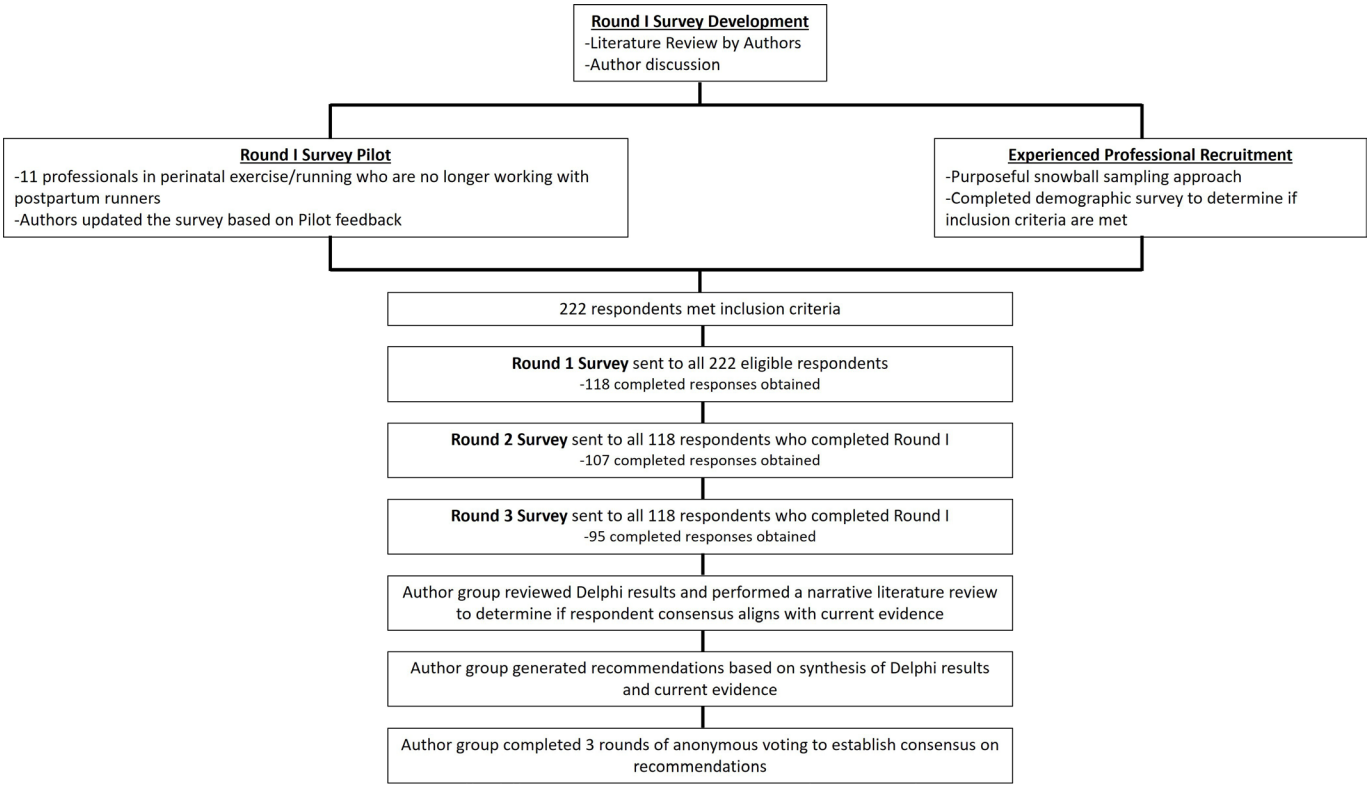

Figure 1 Methods.

media (ie, Twitter, Instagram and Facebook) and word-of-mouth via a purposeful and snowball sampling approach. All prospective participants completed an online recruitment survey in which they reported demographic information, profession, number of years working with postpartum runners, and percentage of caseload consisting of postpartum runners. From this online recruitment survey, respondents were eligible to participate (ie, considered experienced professionals) if they were health, rehabilitation and/or fitness professionals with either (a) ≥5 years' experience treating postpartum runners OR (b) if <5 years' experience, their caseload is primarily postpartum runners (≥50%).

The workgroup (authors) consisted of investigators that had an average of 10 years of experience working with perinatal runners and represented a variety of disciplines (exercise physiology, biomechanics, psychology and physiotherapy). All authors reviewed the Delphi results and current literature, then participated in a discussion to finalise recommendations.

Instrument development and piloting

All authors contributed to the development of a pilot survey consisting of open-ended questions with free-text responses (figure 1). Eleven practitioners, who were either retired professionals in the field or were no longer working with this population, were identified by the authors as pilot participants for round 1 of the survey. Pilot participants provided feedback (eg, question clarity), and necessary changes were made before distribution of round I of the survey to study participants. These data were separate from the Delphi survey and used only for development and piloting round I of the survey.

Procedure

A narrative literature review on postpartum physiology/biomechanics, running, RRI and existing run-readiness frameworks (including grey literature) informed the questions chosen for round I of the survey (online supplemental appendix A). For each round, Qualtrics (Seattle, USA) distributed surveys via a personalised email link. Informed consent was obtained prior to entering the survey questions. The definition of 'consensus' was established a priori as 75% and it was decided to limit voting to three rounds for participant retention.[32] All identified experienced practitioners from the recruitment survey were sent a link to the round I survey. All participants who completed round I were sent the survey for rounds II and III. Each round was live for 3–4 weeks with weekly email reminders sent to respondents who had not completed the survey. Four authors (SMC, MHD, SD and RED) with experience in Delphi studies or similar mixed-methods research undertook thematic coding of the survey free text responses in rounds I and II.

After completion of all rounds of the Delphi survey, all authors contributed to an additional literature search to summarise the current scientific evidence and determine if respondent consensus was in line with current research. Search topics were determined by the themes identified by respondents and a narrative review was conducted. Due to limited evidence in the postpartum running population, searches were not limited to postpartum running-related literature or to systematic reviews or randomised controlled trials. When appropriate, grey literature was included. The level of evidence for each topic, based on the Sackett scale of scientific evidence (figure 2), is provided at the end of each evidence summary section.[33] A table indicating the level of evidence for each article cited is provided in supplemental digital content.

Round I survey

The first round included demographic questions about the respondents. There were also five open-ended questions about screening for run-readiness and three open-ended questions

Level of Evidence	Description of evidence
I	Meta-analyses; systematic reviews; large, high-quality RCTs
II	Small or low-quality RCTs
III	Non-randomized trials; observational studies (including survey studies); cohort studies
IV	Non-randomized trials with historical controls
V	Case series; expert opinion; textbooks; formal consensus; narrative reviews

Figure 2 Levels of evidence. RCTs, randomised controlled trial.

about return-to-running considerations (key milestones, factors to stop running, items that can aid running). In addition, respondents were asked to define 'postpartum' and 'runner' (online supplemental appendix A).

Round II survey

Thematic coding of round I responses led to the development of the round II survey, which was primarily statements with Likert-scale choices (strongly agree, agree, disagree, strongly disagree).

Round III survey

Round III of the survey was designed to establish consensus on the Likert-scale statements from round II. According to Delphi methodology, the same survey questions from round II were presented to the participants with the addition of graphs representing participant responses from round II (percentage of votes for strongly agree, agree, disagree and strongly disagree) in lieu of in-person discussion.[31] Participants were again asked to choose their level of agreement (as per round II) with each statement.

Author recommendations

After reviewing the survey results and completing a narrative literature review, recommendations were proposed based on author discussion and synthesis of the Delphi data and current evidence. An anonymous survey was then sent out to all authors to determine author consensus on the recommendations. Authors completed three rounds of voting: Vote 1 consisted of the original recommendation for each section from the group meeting along with free-text options to indicate dissenting opinions. Vote 2 presented all author-suggested recommendations for each section. Vote 3 again presented all author-suggested recommendations along with the results of round 2 voting.

Diversity, equity and inclusion statement

The all-female author group, representing five countries across three continents, were primarily Caucasian with one woman of colour. Experienced practitioners (respondent group) were included based on number of years working with postpartum runners and thus junior, mid-career and senior level practitioners from a variety of professional backgrounds were included. Only two men participated in the Delphi survey as respondents. In discussing generalisability of our results and limitations in our findings, we recognise that these results may exclude professionals of a low socioeconomic status, where advanced education is unavailable, or from marginalised communities as perinatal care is not part of basic training in many professions. While efforts to recruit diverse respondents with sociocultural differences were made (through personal networks, social media (ie, Twitter, Instagram and Facebook) and word-of-mouth), the recommendations made in this consensus statement may not be reflective of every culture.

RESULTS

Two hundred and twenty-two professionals met the inclusion criteria and were sent the link for round I. 118 participants completed round I. Those 118 participants were sent invitations to complete rounds II and III. 107 completed round II and 95 completed round III. Participants had an average of 8.9 (range 2–37) years' experience working with postpartum runners and represented seven different professions, 12 countries and 4 continents (North America, Europe, Australia and Africa). Most of the participating professionals identified as women (97%) (table 1).

Definitions of 'runner' and 'postpartum'

Consensus

Consensus was reached that 'runner' was defined as 'anyone who runs, regardless of frequency or mileage' (90.6%) and/or 'anyone who self-identifies as a runner' (92.9%). No true consensus was reached on the definition of 'postpartum', though respondents agreed (78.8%) that it does not refer only to the first 12 weeks after childbirth.

Current evidence

Various definitions of 'runner' exist. Some studies identify runners by a certain number of miles per week.[34] Experience level is usually reported (eg, novice, competitive), but standard terminology has not been used, meaning different terms may be used to describe similar cohorts (eg, beginner and novice).[35] The definition of 'postpartum' also varies, focusing on length of time since giving birth (eg, 12 weeks to 2 years).[36–38] The consensus that 'postpartum' does not refer to only the first 12 weeks after childbirth is supported by several studies using time frames >12 weeks to define their postpartum population[7–9 11 12 38–43] and by evidence that postpartum mental health symptoms can still be present up to 3 years postpartum.[44] The inconsistencies in the literature of how long the postpartum phase persists appear to be reflected in several time frames being identified by respondents in free-text responses and inability to reach consensus on one specific time frame.

(No summary of the level of evidence is provided, as consistent definitions are non-existent.)

Recommendation (12/12 authors assent)

This Delphi recommends that someone who self-identifies as a runner should be evaluated and treated as one, regardless of mileage, frequency or skill level. Due to the lack of longitudinal evidence investigating perinatal runners, an individualised

Table 1 Participant demographics

	Round 1	Round 2	Round 3
Total no of surveys started (n)	144	108	96
Total no of surveys completed (n)	118	107	95
Physical therapist/physiotherapist	96	88	80
Occupational therapist	1	1	1
Personal trainer	8	7	6
Chiropractor	1	1	0
Exercise physiologist	5	4	4
Physician	5	4	3
Run coach	1	2	1
Completion rate (%)	53	91	81
Years in current profession (n)			
0–4 years	10	10	8
5–9 years	27	24	22
10–14 years	36	31	28
15–19 years	20	18	15
20+ years	25	24	22
Years working with postpartum runners (years)			
Mean	8.85	8.99	8.93
Range	1–30	1–30	1–30
Percentage of caseload consisting of postpartum runners (n)			
0%–24%	65	57	52
25%–49%	37	35	31
50%–74%	15	14	11
75%–100%	1	1	1
Gender identity of respondents (n)			
Woman	116	105	93
Man	2	2	2
Age (years)			
Mean	38.9	39.0	39.2
Range	23–63	23–63	23–63
Race/ethnicity of respondents (n)			
White	114	103	92
Black/African American	2	2	1
Asian	3	3	3
Other	1	1	1
Respondents who identify as a runner (n)			
Yes	86	79	70
No	32	28	25
Have the respondents themselves given birth? (n)			
Yes	65	60	51
No	21	19	19
Preferred not to answer	32	28	25
Trained in internal pelvic floor muscle assessment? (n)			
Yes		72	75
No, refers to pelvic floor trained provider		20	20
No, relies on symptom reports from patient		6	0
No response		9	0

approach should be taken to determine if the runner is still recovering from pregnancy-related and childbirth-related changes or not. For example, if someone is returning to running at 2 years postpartum, they should still be evaluated or screened for postpartum run-readiness, as pregnancy and childbirth-related impairments may still be present.

Table 2 Key milestones to assess for return to running and suggested metrics for meeting milestones

Key milestones to assess for return to running	Agree/strongly agree in round II (%)	Agree/strongly agree in round III (%)
Pelvic floor strength	**91.5**	**95.3**
Pelvic floor endurance	**89.4**	**94.1**
Pelvic floor coordination	**95.7**	**98.8**
Pelvic organ prolapse	**93.6**	**97.7**
Urinary incontinence	**97.8**	**97.7**
Anal incontinence	**97.9**	**97.7**
Lumbopelvic strength	**96.8**	**95.3**
Lower extremity strength	**95**	**98.8**
Inter-recti distance	62.8	55.3
Balance/ proprioception	**93.6**	**95.3**
Gait analysis	**75.5**	**78.8**

Bold text indicates meets consensus (>75%).

Key milestones that need to be addressed before postpartum return-to-running

Consensus

From round I, 11 themes were identified as key milestones that need to be addressed before return-to-running (table 2), including: pelvic floor muscle (PFM) strength, endurance and coordination; symptoms of urinary incontinence (UI); symptoms of anal incontinence (AI); symptoms of pelvic organ prolapse (POP); lumbopelvic strength; inter-recti distance (IRD); balance and proprioception; lower extremity strength; and running gait analysis. Ten milestones met consensus, with IRD being the only milestone that did not. To note, specific cut-offs or benchmarks were not identified; rather, respondents identified key areas for evaluation.

Current evidence

Symptoms of pelvic floor dysfunction (PFD) are widely reported in nulliparous and parous female runners,[6 9 45–59] and pregnancy and childbirth increase the general population risk of PFD.[60] Reported frequency of UI in postpartum runners ranges from 8% to 57%,[8 9 59] AI was reported in 39% of postpartum runners and 19% reported symptoms of POP.[59] However, no studies have identified specific PFM function (strength, endurance, coordination) parameters that indicate definitive resolution and/or prevention of PFD symptoms in runners.[61–63] There is, however, strong evidence in the general postpartum population that PFM training is effective for treating PFD.[64]

Lower extremity strength has only been investigated in a small cohort of postpartum runners (N=9), which showed significantly lower hip abduction and adduction strength compared with nulliparous controls.[43] When considering the general running population, systematic reviews have reported that musculoskeletal measures (eg, strength) and biomechanical measures (eg, kinematics) are not stand-alone risk factors for RRI.[65]

Current literature on IRD has reported correlations with abdominal muscle strength and fatigability,[39 41 42 66] abdominal pain and quality of life,[67] and no correlation between IRD and low back pain, pelvic girdle pain or UI.[67 68] Increased IRD can also lead to fear-avoidance behaviours, which may be a barrier to return-to-exercise and running.[69 70] One small study showed decreased IRD with exercise in postpartum runners.[38] While there is insufficient evidence to support reduction in IRD with exercise training,[71] abdominal muscle training can influence muscular strength and endurance,[72 73] both of which are shown

Table 3 Consensus on load and impact screen for return to running

Screening activity	Agree/strongly agree in round II (%)	Agree/strongly agree in round III (%)
Walking for 30 min	**97.9**	**97.7**
Single leg balance for 10 s each leg	**89.4**	**92.9**
Single leg squats×10 repetitions each leg	**86.2**	**89.4**
Jogging on the spot for 1 min	**92.6**	**98.8**
Forward bounds×10 repetitions	**79.8**	**87.1**
Hopping in place×10 repetitions each leg	**92.6**	**95.3**
Single leg 'running man' (opposite arm and hip flexion/extension with knee bent)×10 repetitions each side	**85.1**	**84.7**
Calf raises×20 repetitions	**91.5**	**90.6**
Single leg bridge×20 repetitions each leg	**86**	**87.1**
Single leg sit to stand×20 repetitions each leg	**76.3**	**80**
Load and impact screening activities should be performed without exacerbation of musculoskeletal or pelvic health symptoms. Bold text indicates meets consensus (>75%).		

to be impaired in the general postpartum population and in postpartum females with diastasis recti abdominus (DRA).[39 41 42 66]

An initial biomechanical investigation in a small cohort of postpartum runners showed no difference in kinematic and kinetic (except braking loading rate) measures in postpartum running gait when compared with nulliparous controls.[43] Lastly, literature on balance and proprioception is non-existent in the postpartum running population. In the general perinatal population, evidence on changes in static balance is conflicting, with some reporting increased postural sway and others reporting no changes.[74–76] Expert opinions on rehabilitation of postpartum runners have included exercises to improve balance and proprioception.[16 18] Balance and proprioception are recommended assessments for run-readiness following knee and ankle injuries in the general population.[77–80] (Level of evidence: III)

Recommendation (12/12 authors assent)

As incontinence and prolapse symptoms are well documented in both nulliparous and postpartum female runners, as well as in the general postpartum female population, a postpartum runner should ideally be evaluated for these pelvic health-related symptoms prior to initiating running. Runners with PFD should be referred to an appropriate and specialised professional. As RRI and pain are multifactorial, it is recommended to include PFM, lower extremity and lumbopelvic strength as well as balance assessments in the physical examination to aid successful return-to-running; however, due to lack of evidence, no recommendation can be made on PFD (eg, prolapse, incontinence) severity scores, objective strength or balance measurement minimums that would indicate return-to-running readiness. While IRD did not reach consensus as a milestone, runners with abdominal pain or who exhibit fear avoidance behaviours may benefit from assessment.

Load and impact screening

Consensus

Consensus was reached in both rounds that a runner should be able to complete the screening tasks in table 3 without musculoskeletal or pelvic health symptoms before initiating running.

Current evidence

No evidence exists assessing which load and impact screening tasks are ideal for identifying postpartum run-readiness. Several expert opinions recommend being able to walk for 30 min without eliciting/exacerbating cardiorespiratory, pelvic health or other musculoskeletal symptoms prior to engaging in running postpartum.[16–18 20] Two screens have been proposed to evaluate run-readiness, one specifically for postpartum runners. The Running Readiness Scale, which consists of five tasks (hopping, planks, step-ups, single leg squats and wall sits), was proposed to identify injury risk due to movement patterns. An initial study of this scale, validating it against three-dimensional (3D) running biomechanics in asymptomatic novice runners, showed reliability

Table 4 Support items for return to running

Support items	Agree/strongly agree in Round II (%)	Agree/strongly agree in Round III (%)
A runner requiring support items (such as sacroiliac joint belts, taping, compression shorts, etc) is a reason to recommend that someone not resume/participate in/continue running postpartum.	3.2	1.2
Runners should be educated on appropriate breast support before returning to running after childbirth.	**96.8**	**97.7**
Footwear should be assessed for proper fit and compatibility with running goals and current musculoskeletal profile before returning to running after childbirth.	**92.5**	**96.5**
Compression garments (eg, compression shorts/leggings that go over the abdomen, compression socks) can be helpful for some postpartum runners.	**95.7**	**96.5**
Intravaginal support items (eg, pessary, Poise Impressa, tampons, menstrual cups, etc) can be helpful for postpartum runners with prolapse symptoms.	**97.9**	**100**
Intravaginal support items (eg, pessary, Poise Impressa, tampons, menstrual cups, etc) can be helpful for postpartum runners with incontinence symptoms.	**95.7**	**100**
Abdominal and/or low back taping techniques can be helpful for some runners.	**83.9**	**91.8**
Sacroiliac joint belts can be helpful for some runners.	21.5	7.1
Abdominal braces can be helpful for some runners	63	71
If a runner plans to run with their child, the stroller/pram/buggy that they intend to use should be assessed for appropriateness.	**89.4**	**94.1**
Incontinence products (eg, pads, incontinence underwear, etc) can be helpful for some runners.	**92.6**	**98.8**
Runners should not be encouraged to utilise support items (such as sacroiliac joint belts, taping, compression shorts, etc); rather, they should be encouraged to build functional strength so that these items are not necessary.	50.5	42.3
Bold text indicates meets consensus (>75%).		

Table 5 Consensus on when to advise against running

Themes for recommending abstaining from running	Agree/strongly agree (%) Round II	Agree/strongly agree (%) Round III
Pelvic health		
One cannot return to running with symptoms of pelvic organ prolapse	12.7	1.2
One can return to running with mild symptoms of pelvic organ prolapse	**88**	**100**
Presence of severe/significant POP is a reason to recommend that someone not resume/participate in/continue running postpartum	69.9	**80**
One cannot return to running with symptoms of urinary incontinence	10.3	2.4
One can return to running with mild symptoms of urinary incontinence	**92.1**	**98.8**
Presence of severe/significant urinary incontinence is a reason to recommend that someone not resume/participate in/continue running postpartum	67.7	**75.3**
One cannot return to running with symptoms of anal incontinence	26.6	5.9
One can return to running with mild symptoms of anal incontinence	**81.7**	**96.5**
Presence of severe/significant urinary incontinence is a reason to recommend that someone not resume/participate in/continue running postpartum	71	**82.4**
Presence of severe/significant structural pelvic floor muscle injury (eg, levator ani avulsion, anal sphincter injury, etc) is a reason to recommend that someone not resume/participate in/continue running postpartum.	64.5	68.2
Presence of lochia (postbirth vaginal bleeding) is a reason to recommend that someone not resume/participate in/continue running postpartum.	**86.2**	**92.9**
Presence of birth complications/delayed recovery from childbirth is a reason to recommend that someone not resume/participate in/continue running postpartum.	71	**80**
Musculoskeletal		
Presence of musculoskeletal injuries is a reason to recommend that someone not resume/participate in/continue running postpartum.	61.3	50.6
Presence of consistent musculoskeletal pain is a reason to recommend that someone not resume/participate in/continue running postpartum.	59.1	50.6
Inter-recti distance of three finger widths or more without doming is a reason to recommend that someone not resume/participate in/continue running postpartum.	0	3.5
Inter-recti distance of three finger widths or more with doming is a reason to recommend that someone not resume/participate in/continue running postpartum.	41.5	28.2
Presence of diastasis recti abdominis with a hernia is a reason to recommend that someone not resume/participate in/continue running postpartum.	44.6	40
Poor biomechanics with day-to-day mobility (walking, stair negotiation, squats, etc) is a reason to recommend that someone not resume/participate in/continue running postpartum.	57.5	56.5
Poor bone health is a reason to recommend that someone not resume/participate in/continue running postpartum.	39.8	27.1
A runner requiring support items (such as sacroiliac joint belts, taping, compression shorts, etc) is a reason to recommend that someone not resume/participate in/continue running postpartum.	3.2	1.2
Biopsychosocial		
Poor sleep habits (less than 6 hours accumulated sleep/night; no stretches of sleep longer than 4 hours; etc) are a reason to recommend that someone not resume/participate in/continue running postpartum.	44.7	31.8
Poor mental health status that may be worsened by running is a reason to recommend that someone not resume/participate in/continue running postpartum.	**83**	**90.6**
High risk for REDs (ie, poor nutritional intake, history of disordered eating, rapid and drastic weight loss, etc.) is a reason to recommend that someone not resume/participate in/continue running postpartum.	**86**	**89.4**
Other		
Runners with pre-existing medical conditions (ie, present before pregnancy) should receive medical clearance before returning to running.	**85.9**	**91.8**
Runners who wish to run despite symptoms should not be told that they cannot run; rather, running habits may need to be modified (eg, decrease mileage) while the runner is treated for identified impairments.	**94.7**	**100**

Bold text indicates meets consensus (>75%).

and validity with the screen and knee abduction angles.[81] Goom *et al*[19] proposed that a postpartum runner should be able to walk (30 min), and perform exercises (single leg balance, single leg squats, jog, perform forward bounds, hops and single leg running man) to evaluate postpartum load and impact management in regard to provocation of pelvic floor symptoms or pain. To our knowledge, this screen has not been further investigated. A recent study of common running drills in healthy runners included three of the screening tasks (hopping in place (jump rope), jogging on the spot and forward bounds) had 76%, 87% and 104% of the vertical reaction forces of fast running, respectively, indicating that these tasks may closely mimic loads associated with running. Therefore, these drills could be used to screen or progress asymptomatic or symptomatic runners (pain, incontinence, etc) as high impact activities have been associated with incontinence in parous and nulligravid females.[50 82–84] (Level of evidence: V)

Recommendation (12/12 authors assent)

While no studies have examined the influence of ground reaction forces on symptoms in the postpartum runner, high-impact activities have been associated with incontinence in both nulligravid and parous females. As such, it is recommended that, prior to initiating running after childbirth, a series of gradual and progressive load and impact challenges be administered to assess provocation or exacerbation of symptoms.

Table 6 Consensus On Timeline for Return to Running.

Theme for return-to-run timeline	agree/Strongly Agree (%)Round II	agree/Strongly Agree (%)Round III
One cannot return to running before 3 weeks postpartum	**76.1**	**85.5**
One cannot return to running before 6 weeks postpartum	59.8	55.3
One cannot return to running before 12 weeks postpartum	33	20
Timeline post-birth to return to running is person-specific	**94.7**	**100**
Any acute birth injuries (such as perineal tearing, episiotomy, caesarean incision, etc.) should be completely healed before returning to running	**97.9**	**97.6**

Bold text indicates meets consensus (>75%).

Screening for biopsychosocial milestones

Consensus

Unanimous consensus was reached that it is important to assess sleep quality and habits, screen for pre-existing conditions (ie, musculoskeletal or pelvic floor symptoms) and evaluate mental health and fatigue when determining postpartum run-readiness. The importance of screening for energy availability (EA)/relative energy deficiency in sport (97.7%); whether milk supply has been sufficiently established (if desired) (98.8%) and hydration status (98.8%) also reached consensus in both rounds.

Current evidence

Several qualitative studies and expert opinions on readiness for return-to-running have highlighted the need to screen biopsychosocial factors.[7 8 16–19 21 23 45 85] Lack of sleep and a high level of fatigue have been identified as risk factors for pain in postpartum runners.[7] As low EA affects up to 47% of female athletes, several experts on postpartum running have stressed the importance of evaluating this.[16 17 21 86 87] While the difficulties of lactation have not been directly measured in runners, athletes have reported difficulties with breast feeding, supply and training schedules.[13] Experts have also stressed the importance of lactation consultants when working with athletes returning to sports.[20 88] Lastly, per a systematic review in 2019, postpartum depression is common after childbirth (up to 20%)[89]; however, no studies have assessed this in postpartum athletes.[6 90] Due to these biopsychosocial concerns, experts are recommending that the postpartum runner have access to a multidisciplinary team of providers to aid with a successful return to running.[8 16] (Level of evidence: III)

Recommendation (12/12 authors assent)

Based on consensus from experienced professionals working with postpartum runners, as well as current evidence in the general athletic population, it is recommended that runners be screened for concerns or issues with sleep, pre-existing conditions, lactation concerns, hydration, fatigue and mental health. When possible, an appropriate multidisciplinary team, consisting of a variety of healthcare professionals with expertise in the presenting concerns (eg, primary care providers, lactation consultants, pelvic health physiotherapists (PTs), mental health providers, physiatrists, orthopaedic specialists, obstetricians/gynaecologists, urogynaecologists), should work with the runner to address these issues.

Support items/adjuncts for return to running

Consensus

A unanimous consensus was reached that intravaginal support devices (eg, vaginal pessaries) can be helpful for prolapse and incontinence symptoms. Respondents agreed that runners should be educated on proper breast support (97.7%), that footwear should be assessed for fit and compatibility with running goals and current musculoskeletal profile (96.5%), and that runners who plan to run with a stroller have it assessed for appropriateness (94.1%). Respondents disagreed (92.9%) that sacroiliac joint (SIJ) belts can be helpful for some runners, and no consensus was reached on the utility of abdominal braces (71% agreed abdominal braces can be helpful for some runners) (table 4).

Current evidence

There is limited evidence on use of vaginal support pessaries in the postpartum period. Pessaries in addition to PFM training may improve POP symptoms[91] and may help with UI.[92] However, not all females will be candidates for pessary use, those who are may not have success with use, and intravaginal devices may not be as effective as PFM training.[93] The Society of Obstetricians and Gynaecologists of Canada recommends that intravaginal devices be used on an individualised basis and are considered as a first-line option for UI with high-impact exercises or when there are barriers in accessing supervised PFM training.[93] Such devices also promote empowerment and self-management.[93] No studies have been conducted on the use of absorbent items in postpartum runners. Women who exercise and experience stress UI (SUI) do report use of liners or pads to manage symptoms.[94–96]

The breasts can experience high magnitudes of 3D motion during running.[97–99] The amount, and the perceived impact, of breast motion is also influenced by individual breast size.[100] Motion-related breast pain has been reported in up to 40% of athletes and can negatively impact performance.[101] Adequate breast support is considered particularly important perinatally to accommodate breast shape and size changes, especially if lactating, as breast size can increase by 1 or more cup sizes during pregnancy.[102] In the general population, poor breast support is also a barrier to physical activity.[103] An individually fitted sports bra has been shown to reduce motion-related breast pain[97] while improving running economy and performance.[104]

Stroller running is associated with increased energy cost compared with running independently.[105 106] A two-handed approach to stroller running may change trunk, pelvis and hip kinematics[107] but spatiotemporal factors have been shown to be similar compared with independent running.[105]

There is no current evidence on compression garment use or the use of SIJ belts in postpartum runners. Compression garments targeting the lumbopelvic region are reported to reduce perceived symptoms of pain,[108 109] incontinence[110 111] and POP.[112] One study in the general postpartum population found that SIJ belts were helpful in reducing pelvic girdle pain during performance of the Active Straight Leg Raise Test.[113] In the general population with lumbopelvic pain, the effectiveness of SIJ belts is inconclusive and often described as having person-specific results.[114–117] There are also no data on footwear and postpartum runners. Experts have recommended evaluation of a postpartum runner's footwear due to potential pregnancy-related changes and incidence of running-related pain, especially in the lower extremity.[16]

There are currently no data examining taping (abdominal, low back, etc) for postpartum runners. The only studies examining the effect of taping in postpartum populations relate to DRA,

with no implications for running.[118 119] In the general running population, only lower extremity taping has been studied and there is conflicting evidence on whether it provides benefits for pain or performance.[120–123](Level of evidence III)

Recommendations (12/12 authors assent)

Despite low-level evidence in postpartum populations, support items may be beneficial for symptom management in postpartum runners. If an intravaginal support or other continence device is desired by a postpartum runner, a collaborative pelvic healthcare team should assess the runner to determine appropriateness. Absorbent products can also be used, but runners should be encouraged to seek treatment for incontinence. Runners may benefit from a professionally guided, individualised bra fitting to select bras to suit the breast size and type of activity of the postpartum runner. Due to pregnancy-related changes, footwear should also be evaluated. Postpartum runners should be educated on considerations with stroller running for both mother and baby, and that a two-handed approach to stroller running may be favourable. Compression garments may be appropriate adjuncts to active rehabilitation in runners with lumbopelvic and/or PFD symptoms. No recommendation can be made on taping.

Other considerations for readiness to return-to-running after childbirth

Consensus

Respondents unanimously agreed that it is important to consider prior running habits—both during pregnancy and prepregnancy—as well as current training and performance goals when considering run-readiness postpartum. Respondents also agreed that is it important: (1) to prioritise the runner's role in shared decision-making (100%); (2) to honour the runner's wishes about when to return-to-running, even if ideal milestones have not been met (100%); (3) to consider the runner's stress level when determining run-readiness (100%); (4) to include a multidisciplinary care team (97.7%); (5) to assess breathing technique prior to initiating running (84.7%) and (6) to consider the runner's social support when determining run-readiness (98.8%). Table 5 outlines additional considerations for recommending that a postpartum runner not participate in running, such as significant POP (80% agreement).

Current evidence

Several studies have highlighted the importance of shared decision making for patient-centred care.[124 125] Expert opinion encourages consideration of goals for postpartum return-to-running and highlights a multi-disciplinary approach.[16 20 21] Two reviews reported lack of social support as a barrier to postpartum exercise.[126 127]

There is no evidence in postpartum runners on the influence of returning-to-running on PFD symptoms. The American College of Obstetricians and Gynecologists (ACOG) states that symptomatic POP should be further assessed and treated.[128] Lochia can be present under normal circumstances for up to 8 weeks postpartum.[129] Persistence of vaginal bleeding (stage 1 lochia) beyond 2 weeks postpartum is likely indicative of significant pathology,[129] thus medical treatment should be sought and return-to-running should be delayed in this circumstance.

Pain is common in the general running population[130] and among postpartum runners.[7 8 12 45] Some causes of pain in runners (eg, bone stress injuries, medial tibial stress syndrome, etc.) will require a period of rest from running, but other causes of pain (eg, patellofemoral syndrome, etc.) do not have evidence supporting termination of running.[131] No evidence currently exists on treatment of pain (ie, period of rest) in postpartum runners.

There is currently no scientific evidence that there is a relationship among DRA/abdominal wall integrity, diaphragm mechanics and breathing technique. Breathwork has been shown to not influence PFM function.[132] (Level of evidence: V)

Recommendation (12/12 authors assent)

The runner should play an active role in the plan-of-care and decision making. The runner's medical and social history, training and goals should be considered when determining run-readiness. Runners with pain should be evaluated to determine the cause of pain, which will determine whether running is appropriate or not. Significant pelvic health symptoms should be assessed by a specialist (eg, a urogynaecologist) and may take priority over return-to-running in runners who are open to delaying running. A multidisciplinary team is encouraged to identify biopsychosocial red flags to return-to-running. It is important to identify and address barriers when designing the plan of care and return-to-exercise. No literature exists related to breathing mechanics and outcomes for perinatal runners; as such, no expert recommendation can be made.

Education topics for postpartum runners

Consensus

Respondents unanimously agreed that it is important to educate postpartum runners on (1) postpartum physiological and musculoskeletal recovery and (2) a gradual return-to-running after childbirth. Respondents also agreed that it is important to educate runners on the key milestones that indicate run-readiness (98.8%), that hydration and nutrition recommendations should be different for postpartum runners than for runners who are not postpartum (96.5%), and that runners who are lactating should be advised to express milk prior to going for a run (88.2%).

Current evidence

To support continued running during pregnancy, which increases the likelihood of returning to running postpartum,[12] education needs to be specific to running (ie, not general physical activity).[11] The majority of postpartum runners prefer information disseminated via websites and pelvic health PTs.[12] A gradual return to exercise, including running, has been recommended by several expert opinions[6 16–18 20 21] and is supported by RRI evidence suggesting that rapid increases in mileage or intensity increase risk.[133–135] Further information on gradual progression of exercise and running is presented in a companion paper.[23] As novice postpartum runners have higher odds of postpartum pain and up to 84% of postpartum runners have running-related pain across several body regions with the lower limbs being the most common site of pain,[7 8] educating runners on run readiness and how to return to running may be a priority.

No studies have investigated the relationship between breastfeeding and running. Milk secretion in the general postpartum population is associated with 700 ML per day of water loss at 8 weeks postpartum,[136 137] which may lead to dehydration and negatively affect maternal health and exercise performance. Energy needs are also increased while lactating, with a suggested increase of ~500 kcal/day above prepregnancy caloric intake.[138 139] Further discussion of lactation and exercise is presented in a companion paper.[23] (Level of evidence: V)

Recommendation (12/12 authors assent)

Perinatal runners should be provided with running-specific education, during and after pregnancy, that is, individualised to their

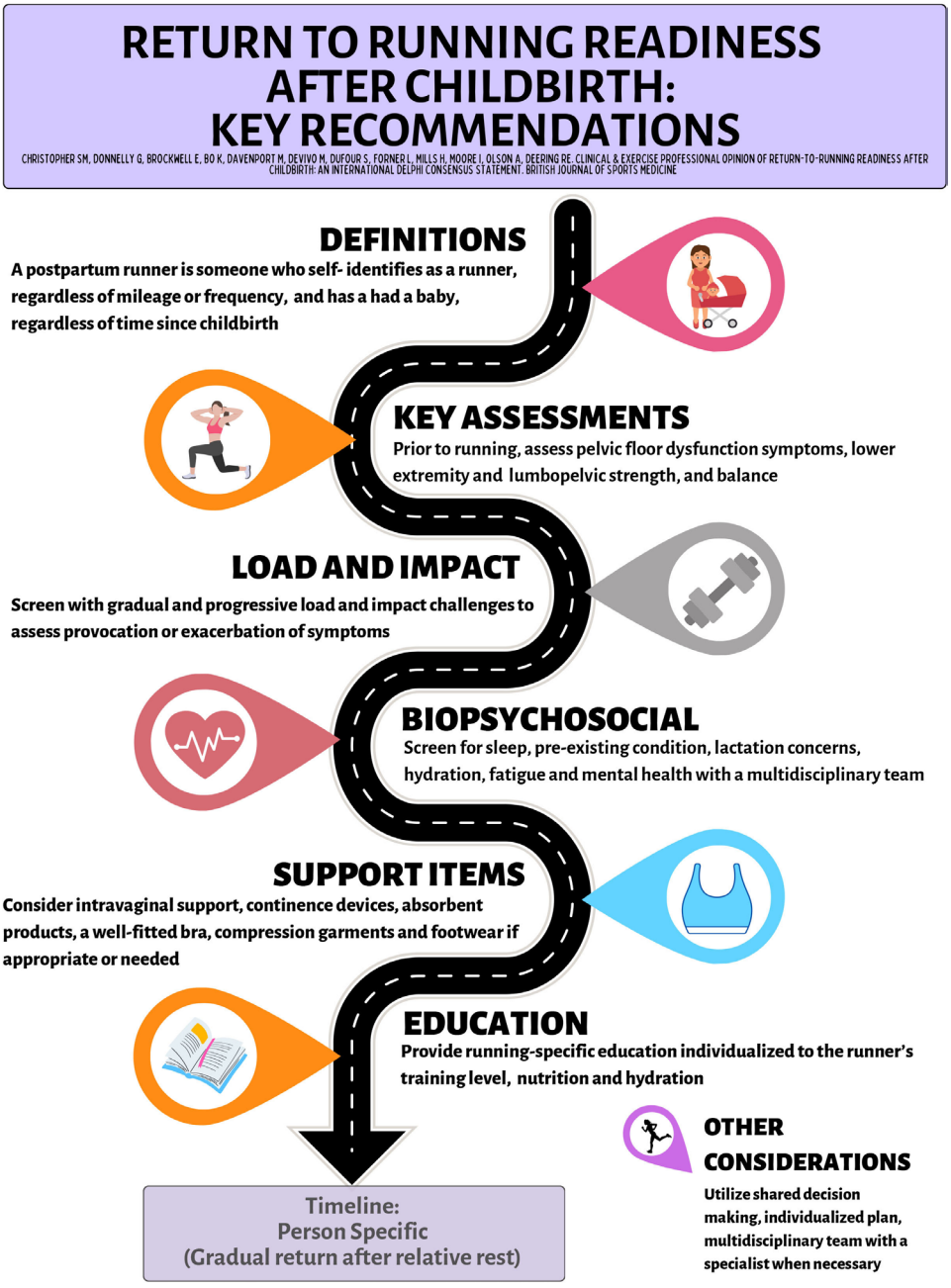

Figure 3 Return-to-running readiness after childbirth: infographic.

training level and goals. Educating postpartum runners on nutrition and hydration should also be a priority.

Timeline for returning to running

Consensus

Five themes were identified in round I for timing of return-to-running and are represented in table 6, with unanimous consensus that 'the timeline to return to running should be person specific'. Respondents also reached consensus that one cannot start running before 3 weeks postpartum (85.5%) and that any birth injury should be completely healed before returning to running (97.6%).

Current evidence

Pelvic health metrics—such as vaginal resting pressure, levator hiatus area, PFM strength and endurance, and bladder neck mobility—have been shown to be altered after childbirth, particularly vaginal delivery in the general postpartum population.[47 48 53] Perineal trauma and surgical birth will also require adequate time for soft-tissue healing.[6 140] Although rare, risk for blood clots, hypertensive disorders, haemorrhage and sepsis is elevated in the first 6 weeks postpartum.[129 141 142] ACOG recommends all females have healthcare provider contact within 3 weeks postpartum, with a 'comprehensive postpartum visit and transition to well-woman care' between 4 and 12 weeks postpartum.[143]

Consensus (from Delphi respondents) was reached that returning to running before 12 weeks postpartum is possible. Longitudinal data investigating PFM function supports that returning to exercise within the first 12 weeks postpartum can be done successfully: PFM strength and endurance, vaginal resting pressure, POP and UI symptoms were similar at 1-year

postpartum in females who returned to exercise (including running) prior to 6 weeks postpartum and those who returned after 6 weeks postpartum.[144] Another longitudinal study demonstrated that early engagement in moderate-to-vigorous physical activity in the early postpartum period (≤6 weeks) did not directly influence pelvic floor dysfunctions at 1-year postpartum, but was associated with a lower symptom burden.[145] Elite female athletes (including runners) often return to exercise before 6 weeks postpartum without increased incidence of incontinence.[90] A study of 42 elite runners (average return-to-running timeline of 6 weeks postpartum; training increased to 80% of prepregnancy levels by 14 weeks postpartum) found no association between musculoskeletal injury and timeline of return-to-running after childbirth.[146]

Data in postpartum recreational runners are more varied. Blyholder *et al*[9] reported that 49.2% of postpartum recreational runners returned within 6 weeks and 34.7% returned between 6 and 12 weeks. Moore *et al*[8] reported a median return-to-run time of 12 weeks (IQR 7–20 weeks), that returning-to-running increased the odds of developing SUI regardless of time frame compared with females who stopped running during pregnancy and did not return-to-running after childbirth, and that 84% of postpartum runners reported pain.[8] Christopher *et al*[7] reported a mean time of 12.7±14.3 weeks to first postpartum run, that 33% of postpartum runners reported running-related pain, and that timeline was not a significant risk factor for postpartum running-related pain.[7] However, some postpartum females have reported delaying return-to-run because they felt it was 'too soon postpartum'.[12] It should be noted that the prevalence of PFD in athletes may be under-reported.[147 148] It should also be noted that there is no evidence on postpartum pelvic floor tissue healing timelines specifically in athletes. (Level of evidence: III)

Recommendation (12/12 authors assent)

Given the range and complexity of factors involved (including injury, tissue healing time frames, pain and PFD symptoms), the lack of high-quality evidence, and the variability of local healthcare accessibility, a person-specific timeline of initiating postpartum running is recommended. Following a period of relative rest and recovery after childbirth, gradual progression of cardiorespiratory fitness and strength training is recommended prior to initiating running (Delphi consensus recommends a minimum of 3 weeks after childbirth prior to return-to-running). Prior training load—both before and during pregnancy—should also be considered. While many recreational runners may be able to return to running independently without significant issues, elite athletes and postpartum runners who are symptomatic (or otherwise concerned) should seek medical advice and/or evaluation by a pelvic health PT to determine run-readiness.

DISCUSSION

To our knowledge, this is the first time an international consensus—consisting of multidisciplinary professionals—has established how postpartum run-readiness is currently determined. This Delphi survey, the corresponding literature review and expert recommendations (figure 3) start to address postpartum run-readiness and highlight knowledge gaps that need to be investigated. Due to the significant variability in postpartum runners, this study emphasises the importance of individualised, athlete centred decision-making. As not all runners will have access to health or fitness professionals, and evidence has demonstrated lack of education to perinatal runners,[11 12] this consensus statement also highlights the importance of education of female runners and (where applicable) running coaches on return-to-running after childbirth.

Research implications

Multiple gaps in research have been identified by this consensus survey and literature review. Future longitudinal studies exploring the development/progression of incontinence and prolapse during and after pregnancy in athletic populations are needed to further understand if screening and rehabilitation of postpartum runners can prevent symptoms of incontinence and prolapse when returning to running; or, if symptoms are already present, if a return-to-running progression can be performed in tandem with rehabilitation without worsening symptoms. Furthermore, the effectiveness of adjuncts to pelvic floor function (eg, compression garments or pessaries) should be explored. In addition, lactating females and females with larger breasts have historically been excluded from studies on breast support, which highlights the need for specific investigations into breast support for lactating athletes. Future studies should also evaluate the role of musculoskeletal strength, as well as gait and balance changes in postpartum RRI risk. Evaluation of pelvic floor healing timelines in athletes is also needed. Validation of all recommendations made in this consensus statement is also required. In general, more high-quality research is necessary in all areas of postpartum exercise, particularly high-impact exercise like running.

Clinical implications

As healthcare providers and fitness professionals—particularly birth providers, primary care providers, personal trainers and PTs—are likely to be asked questions by perinatal runners, it is imperative that these providers are educated on this topic and can refer runners to the appropriate, evidence-informed information or provider to guide running during and after pregnancy.

Limitations

Due to the lack of evidence guiding postpartum return-to-running, recommendations in this consensus statement were made based on integration of experienced professional consensus, literature review and discussion among expert researchers and clinicians in the field. As such, a narrative literature review-not a systematic review-was conducted for the literature review sections. Much of the evidence in this field is level III or below.

Respondents were predominantly white female PTs, and therefore, this study may not accurately reflect the opinions and experiences of other professionals (ie, physicians, male providers, those potentially in lower resource settings etc.) who may be the first contact and/or sole provider evaluating the runner. However, this is the first study to our knowledge that has included occupational therapists, chiropractors and running coaches. This study also included more personal trainers, exercise physiologists and physicians than the current expert opinion publications on postpartum running.[16 18 19 22] All the multidisciplinary participants had a voice in round 1 of the survey, thus informing the survey questions on which all participants voted. Due to the nature of Delphi methodology and multiple survey rounds, the number of respondents also decreased between rounds.

Also, several cultures may have different postpartum practices and rituals (eg, period of rest, confinement practices, avoidance of exercise, dietary requirements, breastfeeding

practices, etc.) that may conflict with the run-readiness recommendations in this Delphi study.[149–152] While efforts were made to recruit diverse respondents (through personal networks, social media (ie, Twitter, Instagram and Facebook) and word-of-mouth) and authors to capture sociocultural differences, the recommendations made in this consensus statement may not be applicable to every culture.

CONCLUSION

Consensus was reached that postpartum runners were defined as anyone who self-identifies as a runner at any time after childbirth. Determining postpartum run-readiness is a multifactorial decision-making process that should be individualised and include the following components: (1) assessment of key musculoskeletal (including pelvic floor) and biomechanical milestones; (2) load and impact screening; (3) screening of biopsychosocial factors; (4) considerations of support items if needed and (5) the runner's training history, current capacity, running goals and training preferences. Due to the complexity of the postpartum experience, a multidisciplinary team approach (eg, primary care providers, lactation consultants, pelvic health PTs, mental health providers, sports medicine providers, orthopaedic specialists, physiatrists, obstetricians/gynaecologists, urogynaecologists, etc.) is recommended when feasible. Education of perinatal runners on postpartum recovery and gradual initiation of exercise is crucial. Further research is required in postpartum runners to identify specific tests and measures to determine readiness to return-to-running while mitigating injury risk and/or symptom provocation in this population.

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Round I Survey

Start of Block: IRB Consent

Return to running after childbirth: A Delphi consensus of experienced and expert professionals

You are invited to participate in the research project identified above which is being conducted by several international experts:
Shefali Christopher, PT, DPT, Ph.D, ATC
Grainne Donnelly BSC Hons, PgCert, MSc (st), MCSP, HCPC
Emma Brockwell BSC Hons HCPC MCSP
Kari Bo PT, Ph.D, Professor, Exercise Scientist
Margie Davenport Ph.D
Marlize De Vivo Ph.D
Sinead Dufour PT, Ph.D
Lori Forner BScH, MPhtySt, Ph.D candidate
Amanda Olson PT, DPT, PRPC
Hayley Mills Ph.D
Izzy Moore Ph.D
Rita Deering PT, DPT, PhD

Why is the research being done?
To develop a consensus on rehabilitation guidelines for women returning to running after childbirth.

Who can participate in the research?
We have identified you to participate through the recruitment survey

What would you be asked to do?
This research is based on the principles of the Delphi method, which is a method for consensus-building by using a series of questionnaires. In the first round you will be given a series of questions about screening and rehabilitation for postpartum runners returning to running. In the second round you will be supplied with the group responses, along with a version of the questionnaire where you are given the opportunity to revise your responses in view of the findings of the group. A general consensus is achieved when there is little disagreement between the respondents. Typically, three rounds of questionnaires are completed (including this one) The first round of the questionnaire takes approximately 20 minutes to complete and you will most likely be required to complete a questionnaire three times over the next 12 weeks. Each subsequent questionnaire should take less time due to the process of reaching consensus.

What choice do you have?
Participation in this research is entirely your choice. Only those people who give their informed consent will be included in the project. Whether or not you decide to participate, your decision will not disadvantage you. If you do decide to participate, you may withdraw from the project at any time.

How much time will it take?
The first round of the questionnaire/survey should take about 20 minutes to complete. Each subsequent questionnaire should take less time due to the process of reaching consensus.

What are the risks and benefits of participating?
There are no anticipated risks associated with participating in this research. While there are no anticipated benefits to you personally in participating in this research, the findings will contribute to the available literature on the subject which may lead to indirect benefits for your practice and knowledge as a physical therapist and your future patients.

How will your privacy be protected?
The collected data will be stored securely on password protected computers of the research team. Data will be retained for a minimum of 5 years as per Elon University policy provisions. The data file will be deleted at that time. Due to the nature of a Delphi survey the response you provide will be identifiable only to one investigator (Shefali Christopher). Only group level responses will be reported. The survey will be stored on a password protected server through Qualtrics software. This company is a common vendor used for survey research and has significant data protection policies in place. Please see the Qualtrics security statement here: http://www.qualtrics.com/security-statement/. Following the data collection period, the data will be downloaded from the Qualtrics server and securely stored on the password-protected computers that are only accessible by the research team. The computer and your data will be within locked-offices of the research team. Your results will be destroyed in accordance with Elon University policies. To the extent allowed by law, we limit the viewing of your personal information to people who have to review it. We cannot promise complete secrecy. The IRB and other representatives of these organizations may inspect and copy your information.

How will the information collected be used?
The collected data may be presented in peer-reviewed publications or conferences. You can access a copy of the published report by visiting this webpage: https://www.elon.edu/e/directory/profile.html?user=schristopher3 Individual participants will not be named or identified in any reports arising from the project. Only group level responses will be reported.

What do you need to do to participate?
Please read this Information Statement and be sure you understand its contents before you consent to participate. If there is anything you do not understand, or you have questions, please contact the research team. If you would like to participate, please click the button below. Completion and submission/return of this online survey will be taken as your consent to

participate.

Further information

If you would like further information, please contact the primary investigator below Shefali Christopher, Assistant Professor, Elon University (schristopher3@elon.edu)

Complaints about this research

This project has been approved by Elon University's Institutional Review Board (Protocol 22-112) Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to Stephen Bailey Elon IRB chair, telephone (336) 278-6346 or e-mail them at baileys@elon.edu.

Q1 The following questions will ask you about your demographics. Please provide as much detail as possible.

What is your current occupation?

- ○ Physical therapist/ Physiotherapist
- ○ Run Coach
- ○ Physician (MD, MBBS, etc)
- ○ Personal trainer
- ○ Exercise physiologist
- ○ Pilates instructor
- ○ Osteopath
- ○ Other _____

Q2 Please list your credentials below (e.g., Doctor of Philosophy, Bachelor in Physiotherapy, Women's Health Certified Specialist, Sports Certified Specialist, Certified Advanced Practitioner in Pelvic Health, etc.) Please do not use acronyms.

Q3 How long have you been practicing in your current profession?

- 0-4 years
- 5-9 years
- 10-14 years
- 15-19 years
- 20+ years

Q31 How many years have you worked with postpartum runners? Please enter only the number (e.g. 5)

Q33 Within the past five years, in an average work week, how many of your clients were postpartum runners?

- 0-24% of total clients were postpartum runners
- 25-49% of total clients were postpartum runners
- 50-74% of total clients were postpartum runners
- 75-100% of total clients were postpartum runners

Q4 Country, state/province/county and city of practice:

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Q5 Country where you received training for your current profession:

Q7 What are some referral sources for postpartum runners for your practice? (Please check all that apply)

- ☐ Birth provider
- ☐ Health Visitor
- ☐ Primary care physician
- ☐ Self-referal by patient/client
- ☐ Other (please provide details) _____

Q8 How are you paid for your services? (Please check all that apply)

- ☐ Insurance
- ☐ Private pay by client
- ☐ National health service
- ☐ Other (Please provide details) _____

Q9 What is your age (years)?

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Q10 What gender do you identify with?

- ○ Man
- ○ Woman
- ○ Non-binary / third gender
- ○ Prefer not to say

Q11 Which ethnicity do you most closely identify with (choose all that apply)

- ☐ White
- ☐ Black or African American
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ South east Asian
- ☐ Native Hawaiian or Pacific Islander
- ☐ Indigenous
- ☐ Other

Q12 Are you a runner?

- ○ No
- ○ Yes

Q13 Have you given birth?

- ○ No
- ○ Yes

Q14 The following questions are about screening for readiness to return to running. We understand that each runner has unique individual needs and would like as much detail as you can provide for each of these questions.

Q15 What are the key milestones (e.g., musculoskeletal status, pelvic health status, physiological/biopsychosocial variables, etc.) that your runners need to meet in order to return to running after childbirth?

Q16 How do you identify if the runner has met those milestones?

Q17 What resources (Scientific literature, continuing education courses, personal experience, etc.) do you use to determine the milestones and whether they have been met?

Q18 What tests and measures should a clinician use to determine run readiness?

Q19 Do you have any other comments on determining readiness to run that do not fall into the above categories?

Q20 The following questions are about rehabilitation plans for return to running. We understand that each runner has unique individual needs and would like as much detail as you can provide for each of these questions

Q21 What key muscle groups should we target with exercise to prepare for return to running?

Q22 How should you progress postpartum runners to achieve the milestones to initiate running?

Q23 How much mileage should a runner begin with when initiating a postpartum return to running plan?

Q24 How should you progress postpartum runners to achieve the milestones required to advance run training (i.e., increase mileage, add speed/tempo work, etc.)?

Q25 What factors cause you to recommend that someone NOT resume/participate in/continue running after childbirth?

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Q26 What other items should be considerations with running after childbirth (e.g., pessary, compression shorts, sports bra, SI belt, etc.)?

Q27 If you feel like the runner is not progressing, where do you send them next?

Q28 Once impairments are resolved, do you continue to see the runner until performance goals are met?

- ○ Yes
- ○ No

Display This Question:

If Once impairments are resolved, do you continue to see the runner until performance goals are met? = No

Q29 If no, to whom do you refer runners to continue to work on performance issues once impairments have been resolved?

Q34 What is your definition of postpartum?

_____

Q35 What is your definition of runner?

_____

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Supplemental Digital Content: Current Level Evidence Section Levels of Evidence			
	Authors	**Study Design**	**Level of Evidence**
Definitions of 'runner' and 'postpartum'	Christopher et al[7]	Cohort Study	Level III
	Moore et al[8]	Cohort Study	Level III
	Blyholder et al[9]	Cohort Study	Level III
	Donnelly et al[11]	Cohort Study	Level III
	James et al[12]	Cohort Study	Level III
	Foch et al[34]	Systematic Review and Meta Analysis	Level I
	Kakouris et al[35]	Systematic Review	Level I
	Paladine et al[36]	Editorial	level V
	Thein-Nissenbaum, J[37]	Cohort Study	Level V
	Deering et al[38]	Cohort Study	Level III
	Hills et al[39]	Cohort Study	Level III
	Deering et al[40]	Cohort Study	Level III
	Deering et al[41]	Cohort Study	Level III
	Deering et al[42]	Cohort Study	Level III
	Christopher et al[43]	Cohort Study	Level III
	Putnick et al[44]	Cohort Study	Level III
Key Milestones that Need to be Assessed/Reached Before Postpartum Return-to-Running	Bo et al[6]	Consensus statement & systematic review	Level I
	Moore et al[8]	Cohort Study	Level III
	Blyholder et al[9]	Cohort Study	Level III
	Christopher et al[43]	Clinical Commentary	Level V
	Donnelly et al[18]	Expert opinion	Level V
	Deering et al[38]	Cohort Study	Level III
	Hills et al[39]	Cohort Study	Level III
	Deering et al[41]	Cohort Study	Level III
	Deering et al[42]	Cohort Study	Level III
	Christopher et al[45]	Cohort Study	Level III
	Christopher et al[16]	Clinical Commentary	Level V
	Guzmán Rojas et al[46]	Cohort Study	Level III
	Hilde et al[47]	Cohort Study	Level III
	Hilde et al[48]	Cohort Study	Level III
	Martin- Martin et al[49]	Cohort Study	Level III
	Nygaard and Shaw[50]	Narrative Review	Level V
	Reimers et al[51]	Cohort Study	Level III
	Shin et al[52]	Narrative Review	Level V

	Stær-Jensen et al[53]	Cohort Study	Level III
	Vermandel et al[54]	Cohort Study	Level III
	Wallace et al[55]	Narrative Review	Level V
	Hadizadeh-Talasaz et al[56]	Systematic review and Meta Analysis	Level I
	Carvalhais et al[57]	Cohort Study	Level III
	de Mattos Lourenco et al[58]	Systematic Review	Level I
	Forner et al[59]	Cohort Study	Level III
	NICE Guidelines[60]	Review	Level V
	Borello-France et al[61]	Cohort study	Level III
	Blomquist et al[62]	Cohort study	Level III
	Moser et al[63]	Systematic Review	Level I
	Woodley et al[64]	Cochrane Review	Level I
	Peterson et al[65]	Systematic review and Meta Analysis	Level I
	Gluppe et al[66]	Cohort Study	Level III
	Fuentes Aparicioa et al[67]	Systematic Review	Level I
	Sperstad et al[68]	Cohort Study	Level III
	Eriksson Crommert et al[69]	Cohort Study	Level III
	Eriksson Crommert et al[70]	Cohort Study	Level III
	Gluppe at al[71]	Systematic Review and Meta Analysis	Level I
	Carlstedt et al[72]	Narrative Review	Level V
	Gluppe et al[73]	Randomized Control Trial	Level I
	Goossens et al[74]	Systematic review	Level I
	Bagwell et al[75]	Cohort study	Level III
	Ramachandra et al[76]	Cohort study	Level III
	Han et al[77]	Systematic review and meta-analysis	Level I
	Plastaras et al[78]	Narrative Review	Level V
	van der Worp et al[79]	Systematic review	Level I
	West et al[80]	Systematic review and meta-analysis	Level I
Load and impact screening	Christopher et al[16]	Clinical Commentary	Level V
	Donnelly et al[17]	Clinical Commentary	Level V
	Donnelly et al[18]	Expert opinion	Level V
	Goom et al[19]	Expert opinion (Grey literature)	Level V
	Deering et al[20]	Clinical Commentary	Level V

	Harrison et al[81]	Cohort study	Level III
	Goodson et al[82]	Cohort study	Level III
	Casey and Temme[83]	Narrative Review	Level V
	Pires et al[84]	Systematic Review & Meta-Analysis	Level I
	Nygaard and Shaw[50]	Narrative Review	Level V
Screening for biopsychosocial milestones	Bo et al[6]	Consensus statement with systematic review	Level I
	Christopher et al[7]	Cohort study	Level III
	Moore et al[8]	Cohort study	Level III
	Davenport et al[13]	Cohort Study	Level III
	Christopher et al[16]	Clinical Commentary	Level V
	Donnelly et al[17]	Clinical Commentary	Level V
	Donnelly et al[18]	Expert opinion	Level V
	Goom et al[19]	Expert opinion	Level V
	Deering et al[20]	Viewpoint	Level V
	Deering et al[23]	Consensus Statement	Level V
	Donnelly et al[21]	Editorial	Level V
	Christopher et al[45]	Consensus Statement	Level V
	Christopher et al[85]	Systematic Review	Level I
	Whitney et al[86]	Cohort study	Level III
	Ackerman et al[87]	Cohort study	Level III
	Deering and Mountjoy[88]	Editorial	Level V
	Kołomańska-Bogucka[89]	Qualitative Review	Level V
	Kimber et al[90]	Systematic Review and meta-analysis	Level I
Support items/adjuncts for return to running	Christopher et al[16]	Clinical Commentary	Level V
	Bugge et al[91]	Cochrane Review	Level I
	Lipp et al[92]	Cochrane Review	Level I
	Dufour et al[93]	Clinical Practice Guideline	Level V
	Dakic et al[94]	Cohort Study	Level III
	Brennand et al[95]	Cohort Study	Level III
	Culleton-Quinn[96]	Systematic Review	Level I
	McGhee and Steele[97]	Narrative Review	Level V
	Risius et al[98]	Narrative Review	Level V
	Barbage and Cameron[99]	Cohort Study	Level III
	Nolte et al[100]	Cohort Study	Level III

	Brisbine et al[101]	Cohort Study	Level III
	Coltman et al[103]	Cohort Study	Level III
	Fong and Powell[104]	Cohort Study	Level III
	Morris et al[102]	Cohort Study	Level V
	Alcantara and Wall-Scheffler[105]	Cohort Study	Level III
	Sandbakk et al[106]	Cohort Study	Level III
	O'Sullivan et al[107]	Cohort Study	Level III
	Szkwara et al[108]	Systematic Review	Level I
	Gavrilov et al[109]	Cohort Study	Level III
	Szkwara et al[110]	Quasi-experimental Controlled Study	Level III
	Okayama et al[111]	Randomized Control Trial	Level I
	Milner et al[112]	Cohort Study	Level III
	Fitzgerald et al[113]	Cohort Study	Level III
	Arumugam et al[114]	Cohort Study	Level III
	Hammer et al[115]	Cohort Study	Level III
	Soisson et al[116]	Cohort Study	Level III
	Toyohara et al[117]	Biomechanical perspective	Level V
	Jobanputtra and Patil[118]	Narrative Review	Level V
	Ptaszkowska et al[119]	Randomized Control Trial	Level II
	Malhotra et al[120]	Randomized Control Trial	Level II
	Watcharakhueankhan et al[121]	Cohort Study	Level III
	Ozmen et al[122]	Cohort Study	Level III
	Rogan and Baur[123]	Cohort Study	Level III
Education Topics for Postpartum Runners	Bo et al[6]	Consensus statement with Systematic Review	Level I
	Christopher et al[7]	Cohort Study	Level III
	Moore et al[8]	Cohort Study	Level III
	Donnelly et al[11]	Cohort Study	Level III
	James et al[12]	Cohort Study	Level III
	Christopher et al[16]	Clinical Commentary	Level V
	Donnelly et al[17]	Clinical Commentary	Level V
	Donnelly et al[18]	Expert Opinion	Level V
	Deering et al[23]	Consensus Statement	Level V
	Deering et al[20]	Clinical Commentary	Level V

	Donnelly et al[21]	Editorial	Level V
	Nielsen et al[133]	Clinical Commentary	Level V
	Ramskov et al[134]	Randomized Control Trial	Level I
	Nielsen et al[135]	Cohort study	Level III
	Ndikom et al[136]	Cochrane Review	Level I
	Bardosono et al[137]	Cohort study	Level III
	Lee and Kelleher[138]	Review	Level V
	Nutrient Reference Values for Australia and New Zealand[139]	Position Statement	Level V
Other considerations for readiness to return-to-running after childbirth	Christopher et al[16]	Clinical Commentary	Level V
	Deering et al[20]	Viewpoint	Level V
	Donnelly et al[21]	Editorial	Level V
	Tousignant-Laflamme et al[124]	Systematic Review	Level I
	Hoffmann et al[125]	Narrative Review	Level V
	Makama et al[126]	Systematic Review	Level I
	Edie et al[127]	Systematic Review	Level I
	ACOG Practice Bulletin[128]	Position Statement	Level V
	Symonds and Arulkumaran[129]	Textbook	Level V
	Christopher et al[7]	Cohort Study	Level III
	Moore et al[8]	Cohort Study	Level III
	James et al[12]	Cohort Study	Level III
	Christopher et al[45]	Consensus Statement	Level V
	van Gent et al[130]	Systematic Review	Level I
	Arnold and Moody[131]	Narrative Review	Level V
	Bo et al[132]	Systematic Review	Level I
Timeline for returning to running	Bo et al[6]	Consensus Statement	Level I
	Christopher et al[7]	Cohort Study	Level III
	Moore et al[8]	Cohort Study	Level III
	Blyholder et al[9]	Cohort Study	Level III
	James et al[12]	Cohort Study	Level III
	Hilde et al[47]	Cohort Study	Level III
	Hilde et al[48]	Cohort Study	Level III
	Stær-Jensen et al[53]	Cohort Study	Level III
	Kimber et al[90]	Systematic Review and Meta Analysis	Level I
	Symonds and Arulkumaran[129]	Textbook	Level V
	Tilak et ak[140]	Cohort Study	Level III

	Li et al[141]	Cohort Study	Level III
	Snydal[142]	Narrative Review	Level V
	ACOG Committee Opinion[143]	Opinion	Level V
	Tennfjord et al[144]	Cohort Study	Level III
	Nygaard et al[145]	Cohort Study	Level III
	Darroch et al[146]	Cohort Study	Level III
	Rodríguez-López et al[147]	Cohort Study	Level III
	Mahoney et al[148]	Cohort Study	Level III