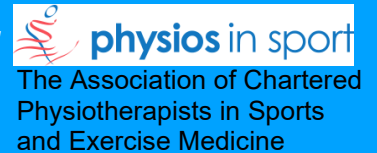


Returning to running postnatal – guidelines for medical, health and fitness professionals managing this population

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Foreward

There are currently no national/international guidelines that standardise practice and provide a framework to support health professionals working with women who wish to return to running after having a baby. Musculoskeletal pain, urinary incontinence, abdominal separation (Blyholder *et al.* 2016) and pelvic organ prolapse (POP) are prevalent conditions amongst postnatal runners. Awareness and understanding of the importance of optimal postnatal recovery in the prevention and management of these “common but not normal” conditions is increasing.

These guidelines have been created by the dedicated work of Tom Goom, Gráinne Donnelly and Emma Brockwell who have a passion in increasing awareness about the importance of safe and timely return to running postnatal. The evidence base for returning to running in the postnatal period, as well as returning to exercise in general, is limited. This document is based on the best available evidence alongside experienced clinical opinion. It is designed to assist clinical reasoning rather than replace it. It does not provide a prescriptive approach. Instead, the advice will need to be adapted to suit each individual’s needs.

Our vision is that these guidelines will assist health professionals to develop services for their population of postnatal women and that they will provide the **starting point** for the development of professionally-accredited, standardised, research-informed guidelines. We will review and update these guidelines in 1 year and continue to format them for ease of use by non-health professionals, professionals with no specialised training in postnatal care and the general public.

We envisage that the guideline, as it stands, will sit within the public domain and therefore be accessible to the public and all professionals that may come into contact with postnatal women e.g. fitness professionals, midwives etc. It is not our intention that patients, fitness instructors, medical professionals or non-pelvic health physiotherapists should carry out all of the recommended tests in this guide but instead use it to be informed and aware of important signs or symptoms suggesting lack of readiness, and signpost to an appropriate health professional to assist with assessment and rehabilitation e.g. Specialist Physiotherapist, General Practitioner (GPs), Urogynaecological Consultant.

The scope of this guideline is to provide an overview of considerations for the postnatal woman returning to exercise. It is not within the scope of this document to discuss each consideration in detail. We recognise the potential for this guideline to be applied to women post-gynaecological surgeries or those presenting with pelvic health issues not related to pregnancy, however this is not the intended target population and the research has not been considered in this context.

It is advisable that these guidelines are read in their entirety to understand the rationale and evidence behind the recommendations. The evidence has been evaluated using the Royal College of Obstetrician’s and Gynaecologist’s (RCOG) classification outlined in a recent Green Top Guideline (Jauniaux *et al.* 2018):

Classification of evidence levels table:

Level	Evidence
1++	High-quality meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a very low risk of bias
1+	Well-conducted meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a low risk of bias
1-	Meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a high risk of bias
2++	High-quality systematic reviews of case-control or cohort studies or high quality case-control or cohort studies with a very low risk of confounding, bias or change and a high probability that the relationship is causal
2+	Well-conducted case-control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal
2-	Case-control or cohort studies with a high risk of confounding, bias or chance and a significant risk that the relationship is not causal
3	Non-analytical studies; e.g. case reports, case series
4	Expert opinion/Formal consensus from guideline development group

We welcome any feedback and discussion surrounding the guidelines, particularly regarding any evidence base that we may have overlooked. Please email grainne@absolute.physio or physiomum@hotmail.co.uk with any feedback.

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Background

A review of exercise guidelines highlighted the lack of focus, clarity and consistency for postnatal return to exercise (Evenson *et al.* 2014):

- UK guidelines (RCOG 2006) recommend that a medical caregiver should be consulted before resuming pre-pregnancy physical activity.
- Norwegian guidelines (Strømme *et al.* 2000) state that women can generally start exercising after 6 weeks but that self-perception forms an important indicator for what type of exercise to engage in.
- Australian guidelines (SMA 2009) caution against activities that cause high gravitational load on the pelvic floor e.g. running/aerobics
- All of the above guidelines refer to consideration of the mode of delivery with C/S requiring more time to recover.
- No guidelines considered normal deliveries which required stitches (following perineal tears or episiotomy) however a more recent publication (Bø *et al.* 2017) highlighted that operative delivery requires further recovery and consideration prior to return to exercise.
- It was identified that the 6-week postnatal check is too long to wait for postnatal women to resume or begin a low intensity physical activity program including walking, pelvic floor and abdominal muscle exercises (Evenson *et al.* 2014).

Common postnatal pelvic health issues such as urinary incontinence are understood to create a barrier to exercise (Nygaard *et al.* 2005). Engagement in regular physical activity is a public health priority due to the established health benefits that it provides. Considering the points listed above, the authors of these guidelines believe that a framework is required which supports health professionals in providing appropriate advice to women following delivery and returning to exercise. The present authors also recognise and consider that, due to increasing pressures within the National Health Service (NHS), postnatal checks by GPs are not always standard practice across the UK. In addition, GPs have highlighted that they are not provided with adequate training in this area so, where it does occur, the postnatal check may simply involve subjective evaluation and advice. Variations also exist in the amount of antenatal and postnatal care provided throughout the UK.

It is the consensus of the present authors that evaluation by a health professional must take account of patient perceived symptoms regarding safety of exercise in order to provide best practice in supporting women back to running in the postnatal period. It is the responsibility of all health professionals to ensure that they are working within their personal scope of practice, however physiotherapists are well placed to evaluate fitness levels and abilities to support a return to exercise for such women. Using the combined skillsets of musculoskeletal / sports physiotherapists alongside specialist pelvic health physiotherapists will ensure that a comprehensive evaluation of the postnatal woman can be achieved.

After having a baby, the pelvic floor is weak and injured in most women and may need instruction and supervision to be able to perform a correct pelvic floor muscle contraction, especially in those women who did not train these muscles before birth (Bø *et al.* 2017).

High-impact activity, such as running, is associated with a sudden rise in intra-abdominal pressure (Leitner *et al.* 2016). It has also been reported that ground reaction forces of between 1.6 and 2.5 times bodyweight can occur when running at a moderate speed of 11 Kilometers/hour (Gottschall and Kram 2005). Presently, it is unknown if or how much of this is absorbed through the lower limb on impact and therefore it is assumed that some, if not all, of those forces are also transmitted to the pelvic floor. This highlights the importance of strength and speed of contraction in the pelvic floor muscles in order to carry out their role in pelvic organ support and continence during high impact activities (Leitner *et al.* 2016). It also helps reason why weak, less co-ordinated muscles in postnatal women may not achieve the level of function needed to maintain these roles and highlights the importance and indication for adequate rehabilitation. The evidence supporting individualised pelvic floor rehabilitation for the management of urinary incontinence (Bø, 2003; Dumoulin *et al.* 2018; Price *et al.* 2010), POP (Hagen *et al.* 2013), sexual dysfunction (Brækken *et al.* 2015) and the prevention of POP (Hagen *et al.* 2016) is well established.

Evidence-Based Recommendation 1: Postnatal women can benefit from individualised assessment and guided pelvic floor rehabilitation for the prevention and management of pelvic organ prolapse, the management of urinary incontinence and for improved sexual function. **Level 1+**

Guidance for GPs, medical, nursing and allied health professionals caring for this population

Running is a high impact sport placing a lot of demand on the body. In a recent systematic review investigating urinary incontinence in female athletes (De Mattos Lorenco *et al.* 2018), high impact exercise was found to have a 4.59 fold increased risk of pelvic floor dysfunction compared to low impact exercise. Postnatal women need adequate time to heal and regain strength, particularly in the abdominal and pelvic floor muscles after pregnancy and delivery. It is understood that the levator hiatus area widens during pregnancy and increases significantly after vaginal delivery. In most women following vaginal delivery, it is thought to return to a similar area by 12-months postnatal as to that seen immediately after caesarean delivery. However it does not return to prenatal size (Stær-Jensen *et al.* 2015). Recovery of the levator ani muscle and associated connective tissue and nerves is generally maximized by 4-6 months postnatal and is considered to be a reflection of levator hiatus area recovery (Shek *et al.* 2010, Stær-Jensen *et al.* 2015).

Bladder neck mobility increases after vaginal delivery and, while the support to the bladder neck can improve postnatal, mobility remains higher than when measured at 37 weeks gestation (Tooze-Hobson *et al.* 2008, Stær-Jensen *et al.* 2015).

Following caesarean section delivery, consideration should also be given to the healing and remodeling of the uterine scar. It has been shown by ultrasound investigations that the uterine scar thickness is still increased at 6-weeks postnatal suggesting that the process of scar remodeling after caesarean delivery extends beyond the traditionally accepted period (Hamer *et al.* 2007). This is further supported by the understanding that abdominal fascia has only regained 51%-59% of its original tensile strength by 6-weeks post caesarean section and 73%-93% of its original tensile strength at 6-7 months postnatal. (Ceydeli *et al.* 2005).

Table 1: Key signs/symptoms of pelvic floor and/or abdominal wall dysfunction

- Urinary and/or faecal incontinence
- Urinary and/or faecal urgency that is difficult to defer
- Heaviness/pressure/bulge/dragging in the pelvic area
- Pain with intercourse
- Obstructive defecation
- Pendular abdomen, separated abdominal muscles and/or decreased abdominal strength and function
- Musculoskeletal lumbopelvic pain

We therefore recommend that a low impact exercise timeline is followed within the first 3 months of the postnatal period (see *Appendix 2*), followed by a return to running between 3-6 months postnatal, at the earliest, (see *Appendix 3*). In addition to this every postnatal mother, regardless of delivery mode, should be offered the opportunity to receive a pelvic health assessment (from 6-weeks postnatal) with a specialist physiotherapist to comprehensively assess the abdominal wall and pelvic floor including vaginal +/- anorectal examination as indicated. As previously mentioned, the high level evidence supporting pelvic floor rehabilitation for the management of all types of urinary incontinence (Dumoulin *et al.* 2018), the prevention and management of pelvic organ prolapse (Hagen *et al.* 2013; Hagen *et al.* 2016) and for improved sexual function (Brækken *et al.* 2015) is well established. A screen for signs and symptoms of pelvic floor dysfunction (refer to *Table 1, p10*) alongside risk factors (refer to *Table 2, p11*) will assist identification of issues needing to be addressed and highlight the importance of getting a pelvic health assessment and professionally guided rehabilitation (refer to *evidence-based recommendation 1*). A validated tool such as the Australian Pelvic Floor Questionnaire can provide a useful screen for pelvic floor dysfunction.

Evidence-Based Recommendation 2: Return to running is not advisable prior to 3 months postnatal or beyond this if any symptoms of pelvic floor dysfunction are identified prior to, or after attempting, return to running.

Level 4

The increased awareness of pelvic health issues and the importance of adequate postnatal recovery has been identified recently in the NHS 10 year plan (see page 49 section 3.17 at <https://www.longtermplan.nhs.uk/wp-content/uploads/2019/01/nhs-long-term-plan.pdf>) however local resources and pathways may not be adequately in place as yet. It is predicted that the provision of postnatal services will develop and expand over the coming years in light of the NHS long term plan. The development and design of recommended services will inform local pathways regarding who should refer into physiotherapy services or carry out pelvic health screening questionnaires.

Other considerations for medical, nursing and allied health professions caring for the postnatal population are outlined on pages 16-20 “*Additional factors for consideration*” and may highlight further issues that they can address.

Table 2: Risk factors for potential issues returning to running

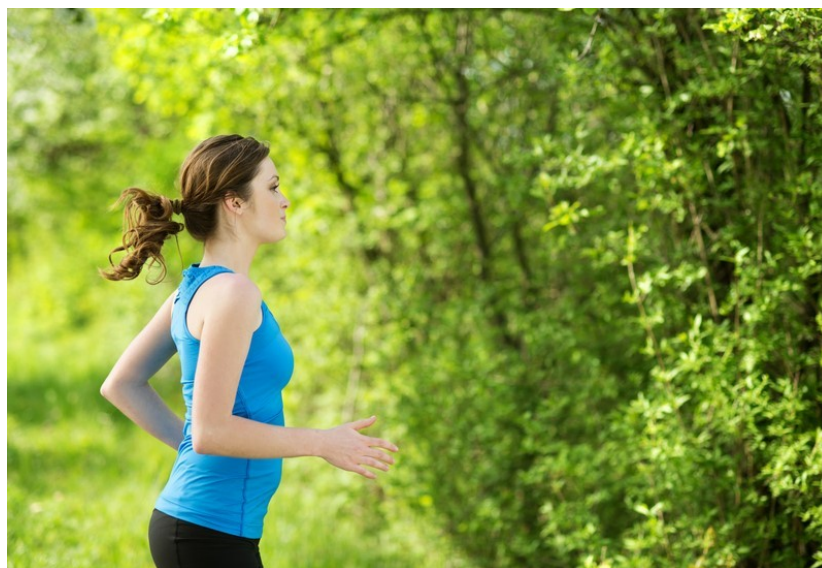
- Less than 3 months postnatal
- Pre-existing hypermobility conditions (e.g. Ehlers-Danlos)
- Breastfeeding
- Pre-existing pelvic floor dysfunction or lumbopelvic dysfunction
- Psychological issues which may predispose a postnatal mother to inappropriate intensity and/or duration of running as a coping strategy
- Obesity
- Caesarian Section or perineal scarring
- Relative Energy Deficiency in Sport (Red-S)

Guidance for patients and non-clinical persons in evaluating readiness to return to running following pregnancy

Running is a high impact sport placing a lot of demand on your body. To be run ready, your body needs time to heal and regain its strength after having a baby. For this reason we recommend following an initial low impact exercises timeline (see *Appendix 2*) followed by return to running between 3-6 months postnatal (see *Appendix 3*). It is recommended that all women, regardless of how they deliver, seek out a pelvic health assessment with a specialist physiotherapist to evaluate strength, function and co-ordination of the abdominal and pelvic floor muscles which are often impacted by pregnancy and delivery.

The importance of getting referral to a pelvic health physiotherapist is further highlighted if any of the following signs and symptoms are experienced prior to, or after attempting, return to running:

- Heaviness/ dragging in the pelvic area (can be associated with prolapse)
- Leaking urine or inability to control bowel movements
- Pendular abdomen or noticeable gap along the midline of your abdominal wall. (This may indicate Diastasis Rectus Abdominis (DRA))
- Pelvic or lower back pain
- Ongoing or increased blood loss beyond 8 weeks postnatal that is not linked to your monthly cycle



Guidance for musculoskeletal and pelvic health physiotherapists caring for this population

The objective measures described in this section are to be used by clinicians within their scope of practice. It is recommended that pelvic health and musculoskeletal physiotherapists work together in their evaluation of postnatal women looking to return to running.

A quick reference guide to evaluate fitness to return to running postnatal can be found in **Appendix 1**.

Criteria for return

- (i) Err on the side of caution due to risk of pelvic floor dysfunction.
- (ii) Combine time-based criteria with specific signs, symptoms, tests and recognised risk factors (refer to *Table 2, p11*).

Time based criteria

Aim for a return to running between **3-6 months postpartum** providing the individual has passed the criteria listed below which will be discussed in greater detail throughout the document. Refer to *Evidence-Based Recommendations 1* and *2* for further understanding.

Assessment of pelvic health

Return to running is **not advisable** if any of the following subjective or objective issues are identified during screening:

Subjective symptoms:

- Urinary and/or faecal incontinence prior to or during commencement of running
- Pressure/bulge/dragging in the vagina prior to or during commencement of running.
- Ongoing or onset of vaginal bleeding, not related to menstrual cycle, during or after attempted low impact or high impact exercise (refer back to care provider).
- Musculoskeletal (MSK) pain e.g. pelvic pain prior to or during commencement of running.

Objective measures:

- Until future research informs the efficacy of hypotheses suggesting reflexive recruitment of pelvic floor activity is stimulated during higher impact activities (Leitner *et al.* 2016) the consensus of this guide is that running is less advisable if there is lower than grade 3 Modified Oxford Manual Muscle Testing (MOMMT) score during digital vaginal (Laycock and Jerwood 2001) or ano-rectal examination. Testing in both crook lying and functional positions, e.g. standing, is recommended to get a true indication of pelvic floor function and pelvic organ support. (*NB-See further guidance below regarding GH+PB in order to assist overall clinical reasoning regardless of strength grade*).
- Reduced pelvic floor muscle endurance. Recommended baseline in standing:
 - ✓ 10x fast reps
 - ✓ 8-12 reps of 6-8 second maximum voluntary contraction
 - ✓ 60 seconds submaximal 30-50% contraction

- GH+PB ≥ 7 cm on Valsalva

Regardless of MOMMT score, it is advisable that the evaluation of the risk of developing pelvic organ prolapse (POP) should be carried out via the GH+PB component of the POP-Q Assessment (Bump *et al.* 1996; Reimers *et al.* 2018) considering that ≥ 7 cm length on valsalva is highly predictive of apical support loss (Khunda *et al.* 2012). If POP or significant apical loss is identified, a vaginal pessary should be considered to reduce the worsening of fascial support and facilitate return to running.

Women who present with $<$ grade 3 MOMMT score without identifiable compromise in their fascial support (i.e. GH+PB < 7 cm) may be considered appropriate for graded return to running if no other signs or symptoms are present during load impact testing (*p16*).

Similarly, women presenting with \geq grade 3 MOMMT score who demonstrate significant apical loss or ballooning at the hiatal area (GH+PB ≥ 7 cm) should have fascial support deficits addressed via a pessary or other support devices prior to return to running. Education regarding the identified risk of POP if the fascial support is not addressed should be provided.

- Evidence of incontinence during examination

NOTE: The identification of any of these issues should indicate referral to (or ongoing care by) a pelvic health physiotherapist. Lack of progress with conservative management or any identified concerns related to pelvic floor dysfunction should indicate liaison with the GP and referral into local continence and/or urogynecology pathways. Local referral pathways will vary – they are likely to include options such as GP referral, direct referrals from physiotherapists and self-referral. The health professional needs to understand the pathway for women under their care.

Key Point Summary 1:

- (i) Every mother should have the option to access a pelvic health assessment.*
- (ii) Subjective symptoms suggesting pelvic floor dysfunction should be identified*
- (iii) Pelvic floor strength, endurance and co-ordination should be evaluated*
- (iv) The presence and risk of pelvic organ prolapse should be evaluated*
- (v) The presence of postnatal pelvic or lower back pain should be evaluated*
- (vi) Lack of progress with conservative measures or identified concern related to pelvic floor dysfunction indicates referral into urogynaecology pathways*

Load and impact management assessment

In order to successfully complete this assessment, the postnatal mother needs to achieve the following without pain, heaviness, dragging or incontinence:

- Walking 30 minutes
- Single leg balance 10 seconds
- Single leg squat 10 repetitions each side
- Jog on the spot 1 minute
- Forward bounds 10 repetitions
- Hop in place 10 repetitions each leg
- Single leg 'running man': opposite arm and hip flexion/extension (bent knee) 10 repetitions each side

Video analysis, similar to methods currently used in running gait analysis, may offer clinicians a platform to evaluate signs of failed lumbopelvic or abdominal load transfer as well as a method of measuring progress between sessions.

Load impact management tests may be repeated after steps have been taken to manage any identified pelvic health issues e.g. retest with a pessary or continence aid such as Contiform and/or sportswear/products aimed at supporting the pelvic floor and lumbopelvic area (Okayama *et al.* 2019) such as EVB Sportswear (Sheridan *et al.* 2015). If symptoms are reduced these can be used to assist the return to impact activities.

Consideration of the risk of Relative Energy Deficiency in Sport (RED-S), a more comprehensive term for what was previously referred to as the Female Athlete Triad Syndrome (Mountjoy *et al.* 2014), is important during this stage of assessment and progression. It describes the impairment of bodily functions due to excess energy expenditure without adequate replacement as a result of excessive activity or other lifestyle factors. Postnatal women with RED-S are at increased risk of stress fractures (Mountjoy *et al.* 2014), pelvic floor dysfunction (Carvalhais *et al.* 2018) and fertility issues. See more about RED-S on p22.

Strength testing

In order to ensure key muscle groups are prepared for running, each of the following movements should be performed with the number of repetitions counted to fatigue. Aim for 20 repetitions of each test.

- Single leg calf raise
- Single leg bridge
- Single leg sit to stand
- Side lying abduction

Assessing the strength of all key hip muscles; abductors, adductors, flexors, extensors and rotators is also recommended (Chumanov *et al.* 2012). This can be done isometrically and measured with a hand held dynamometer where available.

NOTE: Weakness in these areas of strength testing should not be considered a barrier for return to running but instead identify where strength work can be directed.

Evidence-Based Recommendation 3: The assessment of pelvic health, load impact management, and strength testing described in this section is based on expert clinical consensus drawing from the best available evidence. No studies specific to the postnatal population have been carried out to evaluate readiness to return to exercise. **Level 4**

Key Point Summary 2:

- (i) *Evaluate load management through a series of specified tests*
- (ii) *Specified tests should be achieved without heaviness, dragging or incontinence*
- (iii) *Video analysis may offer additional benefit to load management testing*
- (iv) *Assess strength of key muscle groups (calf, quads, hamstrings, glutes, abdomen)*

Additional factors for consideration

The following factors must also be taken into consideration as part of the postnatal evaluation:

Weight - Being overweight increases the load on pelvic floor. Women are considered at a higher risk of pelvic floor related symptoms if they have a BMI >30 (Pomian 2016). In keeping with an increased risk for musculoskeletal injuries (Nielsen *et al.* 2013), it is recommended that weight management is addressed in women with BMI>30 prior to return to running. It is acknowledged that exercise is an important component of weight loss and therefore low risk forms of exercise are advisable until BMI is within targeted range. Refer to NICE guidance (2010) on “Weight Management before, during and after pregnancy” and **Appendix 2** for low impact exercise options.

Fitness - Encourage safe and appropriate early postnatal fitness work. Refer to **Appendix 2** for an example of suggested exercise progression.

It must be noted that assessment and rehabilitation plans will vary depending on individual birth experience and issues.

Breathing – Encourage a slow pace on initial return to running such that would allow the individual to maintain a conversation. Analysis of breathing pattern is recommended as part of the postnatal evaluation in order to ensure optimal breathing strategies are restored including synergy between diaphragm, abdominals and pelvic floor.

Psychological status - screening for Postnatal Depression (PND) (e.g. using the Edinburgh Depression Scale) is appropriate as part of the assessment of readiness for sport (e.g. attitudes to training, evidence of previous exercise addiction). PND is experienced by approximately 20% of mothers (Camacho and Shields 2018). Where running is important for mental wellbeing it is important to advise on alternative coping strategies (such as relaxation, mindfulness, counselling) alongside supervised exercise opportunities e.g. local community ‘couch to 5km’, Park Run, or health trust initiatives for suitable active living in partnership with local gym instructors).

Diastasis Rectus Abdominis (DRA) – Screening / management for DRA, the separation of the outer most abdominal muscles (**see figure 1**), is recommended by a suitably qualified professional, e.g. pelvic health or musculoskeletal physiotherapist with experience in DRA. DRA can impact upon the function of the abdominal wall, particularly rectus abdominus function and rotational torque (Hills *et al.* 2018). There is a paucity of evidence for the impact of running with DRA. The relationship between DRA and pelvic floor dysfunction continues to be debated with no conclusive outcome from the limited research base, however, a recent systematic review confirmed that there is a weak correlation between DRA and pelvic organ prolapse (Benjamin *et al.* 2018).

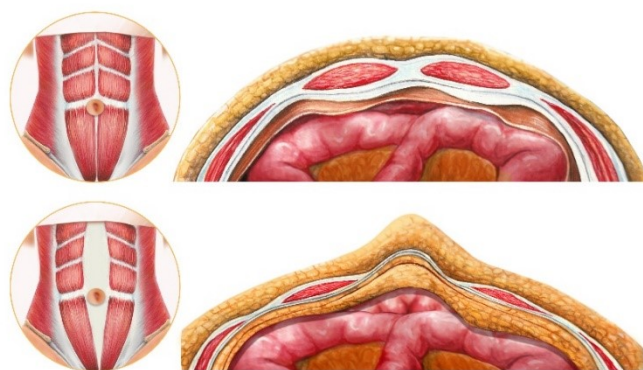


Figure 1 – Diastasis Rectus Abdominis

The expert consensus from specialist pelvic health physiotherapists is that running prior to regaining functional control of the abdominal wall (in order to manage IAP and load transfer) may be counter-productive and result in overloading or compensatory strategies in the pelvic floor. Until such time that research informs us otherwise, the current authors suggest that DRA should be considered in terms of potential risk for pelvic floor dysfunction.

Whilst it is not within the scope of this document to advise on the comprehensive assessment and rehabilitation of DRA, the overall aim is to focus on strategies that optimise IAP management and load transfer across the abdominal wall. A mother can return to running with a diastasis if it is functional, i.e. abdominal muscle separation is present but the mother has strategies to control IAP and transfer load across the abdominal wall.

Failed load transfer can be indicated by abdominal doming/sinking at the midline, lateral shift of the trunk or significant rib flare during load transfer tests such as **active SLR to 30 degrees, resisted trunk rotation** or **chin to chest**.

Scar mobilisation – consideration of scar mobility and the need for scar mobilisation should be given regardless of mode of delivery. Both c-section and perineal scars can result in pain and restriction. A healing wound results in alteration of tissue dynamics due to modifications to the mechanical tension compared to that of the adjacent region (Tomasek *et al.* 2002). This may impact on the function of adjacent muscles and structures. When considering the abdominopelvic location of a c-section, the surgical scar resulting from a Pfannenstiel incision may affect different organs and systems. The digestive, urinary, reproductive and locomotive systems can potentially be affected by a scar in such a location (Comesaña *et al.* 2017). Proposed benefits of scar mobilisation include reducing inflammation, fibrosis, and improving tissue remodeling (Benjamin *et al.* 2008; Bouffard *et al.* 2008). It is therefore recommended as good practice to assess and implement advice and guidance regarding scar mobilisation.

Breastfeeding – The World Health Organisation (WHO) advises women to breastfeed for at least the first 6 months postnatal and up to 2 years (WHO 2016). It is likely that women embarking on return to running are still breastfeeding. It is recognised that breastfeeding prolongs the presence of a hormonally altered environment in the postnatal mother with lower levels of oestrogen and the possibility for slightly raised levels of relaxin to continue. Theories that higher relaxin levels postnatal increase the risk of joint laxity and potential injury have not been proven (Marnach *et al.* 2003; Schauburger *et al.* 1996). It is not fully understood why some breastfeeding women may have increased joint laxity compared to baseline however it is recognised that the overall environment of hormones during this period of time and up to 3 months following weaning may influence joint laxity. This, in turn, may increase the mother's risk of developing injury or dysfunction, including pelvic floor dysfunction or pelvic organ prolapse. It is important to establish whether any pre-existing joint mobility existed prior to pregnancy and whether the environment that breastfeeding creates is significantly exacerbating this.

It is recommended that consideration of breastfeeding status is given to a postnatal mother throughout the process of her evaluation for return to running. Education should be provided about timing of feeds around running, to ensure that the breasts are not overly full or likely to become uncomfortably full during the run (ACOG, 2002). It is also important to consider hydration and the degree of exertion when a mother returns to running, in

order to reduce potential impact upon the supply of milk. Women should be advised that moderate to vigorous exercise during lactation does not affect the quantity or composition of breast milk or impact infant growth (Cary and Quinn 2001; Davies *et al.* 2003; ACOG 2015). It is essential that postnatal mothers feel supported in their choice to continue feeding by offering solutions and advice to support continued breastfeeding while returning to running.

Supportive clothing - Women may benefit from wearing a personally fitted **sports bra** that offers support rather than compression (McGhee *et al.* 2013) as this provides significantly increased breast and bra comfort compared with a standard encapsulation sport bra during exercise (McGhee *et al.* 2010). High breast support has been suggested to be more beneficial in female runners and should be considered when fitting (Milligan *et al.* 2015). Personal fitting of sports bras is not common practice among female runners with most opting for off the shelf sizes however its merit is acknowledged for this population and health professionals are advised to increase awareness of the importance of getting professionally fitted (Brown *et al.* 2014).

Advice should be provided on the importance of supportive **footwear**. It should be noted that shoe size can alter permanently with pregnancy and footwear previously worn should not be presumed to be the correct fit.

Sportswear and clothing aimed at supporting the pelvic floor and lumbopelvic area is gaining increased awareness and understanding for the benefits that they may offer. Okayama *et al.* (2019) demonstrated that wearing supportive underwear was almost as effective as pelvic floor muscle training in reducing stress urinary incontinence in women at the end of a 6-week trial period. Ongoing high-quality studies are required to evaluate how each intervention compares beyond 6-weeks and also specifically in relation to high impact exercise, however, the outcome of this trial suggests that supportive underwear/sportswear may have a role alongside pelvic floor rehabilitation in the management of pelvic floor dysfunction and postnatal return to exercise. Studies investigating the protective and preventative benefits of such products are also welcomed.



Sleep – Sleep is key for recovery from both physical and psychological stress and is frequently restricted in the post-partum period and beyond. Sleep deprivation in athletes is associated with increased injury risk (Milewski *et al.* 2014), lower general health and -increased stress (Biggins *et al.* 2017). Sleep loss is also thought to reduce muscle protein synthesis and impair maximal muscle strength (Knowles *et al.* 2018). Current research recommends 7 to 9 hours of sleep per night (Bonnar *et al.* 2018). Day-time naps can be used to extend sleep and reduce the effects of sleep deprivation (Bird 2013). These can be timed to coincide with the infant's sleep schedule. It can be challenging to increase sleep time so it's important to optimise sleep quality by creating a relaxing routine to prepare for sleep. This includes reducing stimulation from 'screen time', creating a cool, comfortable sleep environment and avoiding consumption of alcohol or caffeine (Bird 2013).

Relative Energy Deficiency in Sport (RED-S) – previously referred to as the Female Athlete Triad Syndrome it refers to impaired physiological functioning caused by relative energy deficiency including impairments of metabolic rate, menstrual function, bone health, immunity, protein synthesis and cardiovascular health (Mountjoy *et al.* 2014; Mountjoy *et al.* 2015). To simplify, it is the impairment of bodily functions due to excess energy expenditure without adequate replacement as a result of excessive activity or other lifestyle factors. The daily demands, physiological effects of breastfeeding and social pressure to return to pre-pregnancy figure/fitness can predispose a postnatal woman to compromised nutrition, poor sleep, excessive exercise and unrealistic expectations which may impact upon the impairments described above. The impact on psychological wellbeing along with the risk of compromised bone health (Mountjoy *et al.* 2014), pelvic

floor dysfunction (Carvalhais *et al.* 2018) and fertility that can occur in the presence of RED-S is an important consideration in the postnatal screening of a woman returning to running and something that care providers should be mindful of. Bone density is already understood to be at risk in the female population as they age and therefore the long-term implications or future impact of RED-S, including whether it is reversible, must be considered at this stage of a woman's life. Education should be provided to women with identifiable risks or signs or RED-S to increase awareness and understanding of this poorly understood condition.

Key Point Summary 3:

- (i) Consideration of weight, fitness, breathing, psychological status, DRA, scar mobility, sleep, breastfeeding status, supportive wear and the risk of RED-S is recommended to provide a holistic approach to the return to running evaluation and address the common issues that this population can encounter.*
- (ii) Prescribed rehabilitation will vary depending on individual presentation and needs.*

Focus on 'What you **CAN** do?'

GOALS:

1. Improve physical and mental wellbeing.
2. Education - importance of postnatal rehab and graded return to running
3. Improve pelvic floor and abdominal function
4. Build strength and fitness
5. Facilitate safe return to sport

Return to running

If a woman is 3 months+ postnatal and is able to pass the tests detailed in this guide it is appropriate to jointly plan a programme that will allow a graded return to running. Key considerations in planning this return are discussed below and summarised in *Appendix 3*.

New and upcoming hypotheses regarding a reflexive initiation of pelvic floor activation that is encouraged during higher impact activity is raising interest and indications for further research (Leitner *et al.* 2016). Graded return to running following adequate postnatal pelvic floor and abdominal muscle recovery is promoted and encouraged by this guide in order to achieve such potential benefits as well as meet public health recommendations surrounding the importance and benefits of physical activity. At present there is very limited research to guide us in planning this return. The consensus of the present authors is that returning to sport is a process of balancing risk and reward for the individual. Addressing risk factors and planning a gradual progression can reduce risk, while including cross-training recovery strategies (especially sleep) can maximise the rewards.

It is sensible to start small, often with around 1 to 2 minutes of running at an easy pace. Setting short-term goals, such as reaching a target distance, can be helpful alongside long term goals such as competing in a race. These goals will influence training progression.



For more challenging performance goals, for example completing a key race in a certain time, it can be helpful for the woman to work with a local running coach.

Risk factors for injury need to be identified and addressed and, when present, a more cautious return to running with a lower starting point and graded progression is

recommended. For example, obesity is thought to be a risk factor for running injury and recent research reports lower injury risk when starting with a total of 3 Kilometers per week when compared to 6 Kilometers (Bertelsen *et al.* 2018).

For run-training progression, building training volume (e.g. running distance/time) prior to increasing training intensity is recommended. Expert consensus of the present authors advises that a total weekly running distance/time should not be increased by more than around 10% per week. However, it should be noted that when starting with very low training volume (such as running just a few minutes) a 10% increase may be prohibitively slow. Consider the **relative increase** (i.e. in percentage) and the **absolute increase** (i.e. in distance/time). A higher relative increase may be manageable when the absolute increase is small. For example progressing from 1 minute to 2 minutes is a high relative increase of 100% but the absolute increase is small, only an additional minute.

Including walk breaks can be helpful to reduce fatigue initially and can be gradually reduced and removed. A 'couch to 5km' programme can be helpful as this usually includes walk breaks and builds gradually towards 5km of running within around 9 weeks. Programmes vary but the NHS 'couch to 5km' starts with 3 runs in week 1 beginning with a brisk 5 minute walk then alternating 1 minute of running with 90 seconds of walking for a total of 20 minutes.

Postnatal women should be advised about the key individual signs that they need to monitor during their return to running. This includes a realistic discussion on what is acceptable and should be expected, as well as any indicators that training needs to be reduced, modified or stopped. Heaviness, dragging, incontinence or moderate to severe pain may suggest excessive training distance or intensity. Mild musculoskeletal pain (0-3/10 on a pain scale) which settles quickly after a run with no pain lasting into the next day is often acceptable and has been used as a guide in management of tendinopathy and other conditions (Silbernagel *et al.* 2007). However decisions should be made based on the individual and the nature and cause of their symptoms.

Running with a buggy

The general advice given to women regarding buggy-running focuses on the baby's health. It is advised that if considering running with a buggy that the buggy is one that is designed for this function i.e. that it has a five-point harness for the baby, fixed front wheels, hand-operated brakes, rear wheel suspension, pneumatic tyres, 3 wheels and a wrist strap. Buggy companies advise that buggy-running should not commence until baby is between 6-9 months old to protect the baby's neck and spine. The research on the physical, physiological and biomechanical effects of running with a buggy on the postnatal mother is limited and variable. The studies are often small. According to Wall-Scheffer (2015), buggy running can be included in the list of 'challenging human locomotor regimes'

O'Sullivan (2015) found that running with a buggy leads to minor changes in trunk, pelvis and hip kinematics with no significant changes at the knee and ankle. Due to these changes in kinematics the authors suggest that flexibility work for the spine, pelvis, hips and gluteal strengthening exercises may be recommended for the runner.



Buggy running, 6 months postnatal. Picture source Tom Gray.

Alcantara and Wall-Scheffer (2017) found that running while pushing a buggy had an increased energy cost when compared with running independently. They investigated 3 different types of buggy pushing methods: Push / Chase, 1 handed buggy-running and 2

handed buggy-running. Whilst finding that speed and stride length are decreased when running with a buggy, they found that the 2 handed method resulted in a speed and stride length most similar to non-buggy running.

The authors of these guidelines recommend that women do not consider running with a buggy until their baby is at least 6-9 months old (as per manufacturers guidelines). Further, that when they do start buggy-running, the buggy is designed for running and the woman commences slowly, in a graded fashion, initially using the 2 handed technique. A strength and stretch program for spine, pelvis, and hips should also be advised.

Evidence-Based Recommendation 4: The recommendations for considering additional factors in a woman's postnatal evaluation such as weight, breathing, psychological status, DRA, breast health/feeding, RED-S and running with a buggy are made by considered expert consensus based on the best available evidence. There is a paucity of research investigating these factors specific to the postnatal population and running. **Level 4**

Key Point Summary 4:

- (i) Once a woman is 12 weeks postnatal and passing the tests recommended in these guidelines plan as graded return to running*
- (ii) Agree a manageable starting point with short and long term goals*
- (iii) Progress training gradually and adapt it to individual needs and risk factors*
- (iv) Monitor the response to running and modify where needed*
- (v) Consider buggy running as an option, not before the baby is 6-9 months old, starting slowly with a 2 handed technique*

Summary of Evidence-Based Recommendations

Recommendation	Level of Evidence
1. Postnatal women can benefit from individualised assessment and guided pelvic floor rehabilitation for the <u>prevention</u> and <u>management</u> of pelvic organ prolapse, the management of urinary incontinence and for improved sexual function.	Level 1+ - Well-conducted randomised controlled trials or randomised controlled trials with a low risk of bias
2. Return to running is not advisable prior to 3 months postnatal or beyond this if any symptoms of pelvic floor dysfunction are identified prior to, or after attempting, return to running.	4 – Expert opinion
3. Assess pelvic health, load impact management and strength testing in order to evaluate readiness to return to running postnatal	4 – Expert opinion
4. Consider additional factors in a woman's postnatal evaluation such as weight, fitness, breathing, psychological status, DRA, breast support and feeding, RED-S and running with a buggy	4 – Expert opinion

Moving forward: further guideline development

Further development of this guide will aim to extend guidance to the pregnant and post-gynecological surgery populations. The potential benefits of exercise and weight training during pregnancy in order to optimise the return to postnatal running without complications are beginning to be recognised (Blyholder *et al.* 2016). Links to comprehensive guides on the specific components highlighted within this document will increase the overall understanding and implementation of service improvements to this population. This should be combined with systematic grading of the strength of the research in order to provide greater clarification to health professionals. There is a significant need for high-quality research studying return to exercise for the postnatal population in order to inform future updates of this guide. Prospective cohort studies would provide insight into the determinants of common problems (PND, weight complaints and musculoskeletal issues including pelvic floor dysfunction) from a prevention viewpoint. Randomised controlled trials would provide

insight into the most effective treatment regimens for women with these problems. Further investigation and clarification to understand newer hypotheses in stress urinary incontinence about the reflexive response of the pelvic floor to load as well as the potential caudal displacement of the pelvic floor during high impact as a purposeful eccentric response (Leitner *et al.* 2016; Leitner *et al.* 2017) is indicated. The present authors hope that you find this document a useful starting point until future, more comprehensive editions are available.

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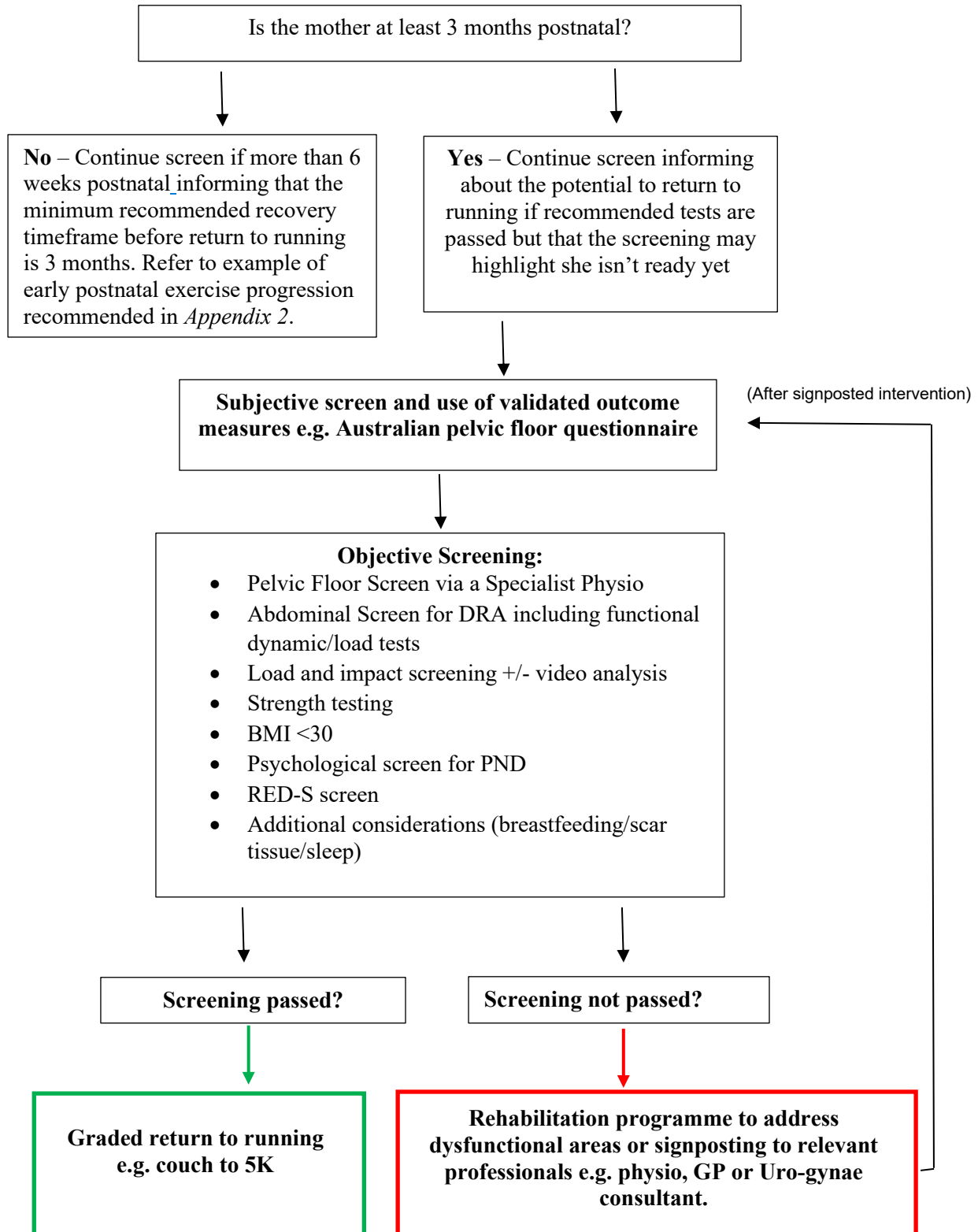
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Appendix 1

Flow chart of considerations to guide return to running postnatal



Appendix 2

Example of exercise progression for the early postnatal period (0-3 months)

Week 0 to 2

- Pelvic floor muscle exercises (once catheter removed) targeting strength and endurance functions.
- Basic core exercises e.g. pelvic tilt, bent knee drop out, side lying abduction.
- Walking (for cardiovascular exercise).

Week 2 to 4

- Progress walking/pelvic floor muscle/core rehab.
- Consider introduction of squats, lunges and bridging, in line with the functional requirements of day-to-day life as a new mother.

Week 4 to 6

- Introduce low impact exercise e.g. static cycling or cross-trainer taking into account individual postnatal recovery, mode of delivery and perineal trauma. Recovery should be such that the new mother is comfortable sitting on a saddle.

Week 6 to 8

- scar mobilisation (for either c-section or perineal scar)
- power walking
- increased duration/intensity of low impact exercise
- deadlift techniques beginning at light weights no more than the weight of the baby in a car seat (15kg) with gradual load progression e.g. barbell only with no weight. This aims to strengthen and restore strategies for carrying out the normal everyday tasks required when caring for a newborn and/or older siblings.
- resistance work during core and lower limb rehab

Weeks 8 to 12

- Introduce swimming (if lochia has stopped and there are no issues with wound healing).
- Spinning (if comfortable sitting on a spinning saddle).

Appendix 3

Return to running 12 weeks postnatal and beyond

- Graded to return to running e.g. NHS 'couch to 5km' plan
- Goal specific – agree short and long term goals
- For challenging goals consider working with a running coach
- Risk factors to injury e.g. obesity reduce distance to a couch to 3km rather than 5km
- Build training volume (e.g. distance/time) before intensity
- Monitor signs and symptoms and modify program appropriately or signpost to professional help to address postnatal issues