

14 **ABSTRACT**

15 Postpartum women frequently engage in running. In the absence of official guidance
16 on returning-to-running postpartum, physical therapists rely on clinical experience
17 alongside the available literature. Subsequently, the traditional evaluation of
18 postpartum readiness for running tends to focus on musculoskeletal factors. This
19 clinical commentary addresses how to evaluate and manage postpartum return-to-
20 running in a systematic order by discussing relevant whole-systems considerations
21 beyond the musculoskeletal system, whilst also highlighting possible interactions
22 between relevant considerations.

23 Discussion: Using a whole-systems biopsychosocial approach, physical therapists
24 should consider the following when managing and evaluating readiness to return-to-
25 running: physical deconditioning, changes to body mass, sleeping patterns,
26 breastfeeding, relative energy deficiency in sport, postpartum fatigue and thyroid
27 autoimmunity, fear of movement, psychological wellbeing and socioeconomic
28 considerations. Undertaking a risk-benefit analysis on a case-by-case basis using
29 clinical reasoning to determine readiness to return-to-running postpartum should
30 incorporate these considerations and their possible interactions, alongside
31 considerations of a musculoskeletal evaluation and graded exercise progression.

32 Conclusions: Return-to-running postpartum requires an individualized, whole-systems
33 biopsychosocial approach with graded exercise progression, similar to the
34 management of return to sport following musculoskeletal injuries.

35 Key Words: biopsychosocial, fear of movement, breastfeeding, relative energy
36 deficiency in sport, whole-systems

37

38 **Introduction**

39 Running is a popular form of exercise, and broadly fits under the term physical activity.
40 Female participation in running has increased in recent years,^{1,2} especially in females
41 of reproductive age.³ Postpartum women likely engage in running due to its
42 convenience of access, cost-effectiveness and flexibility during a transitional period in
43 their life.⁴ In recent years, the need to consider compromised abdominopelvic health
44 in postpartum women who return to exercise too soon has been highlighted.^{2, 5-7} This
45 is a positive step towards stimulating female focused research and enabling the
46 formulation of clinical practice guidelines.⁶ However, currently there is a lack of official
47 guidance to inform physical therapists supporting postpartum women back to running.
48 This means clinicians need to draw upon clinical experience, alongside available
49 literature, and competently apply it to this population. Consequently, clinical evaluation
50 of postpartum readiness for running focuses primarily on musculoskeletal
51 abdominopelvic recovery. Whilst it is important to address the profound physical
52 changes occurring throughout pregnancy and childbirth,⁸⁻¹⁰ we argue that there is a
53 need to move beyond only evaluating specific body regions or musculoskeletal health.
54 We propose that a whole-systems approach should be used by applying a
55 biopsychosocial model to postpartum care and considering other aspects, such as
56 psychological and lifestyle factors.⁶

57 This clinical commentary will address how to evaluate postpartum return-to-running by
58 discussing relevant whole-system considerations beyond musculoskeletal recovery.
59 Using the biopsychosocial model and, available scientific and clinical understanding,
60 we will review each consideration in a systematic order. While doing so, we will
61 highlight possible interactions and relationships between the relevant factors (Figure
62 1). Our aim is to provide physical therapists with a greater understanding of how such

63 factors influence the readiness of postpartum women to progress exercise, enabling
64 them to confidently and holistically determine suitability to return-to-running.

65 *(Insert Figure 1 here)*

66 **Physical deconditioning**

67 The first consideration is that pregnancy and childbirth will ensue some degree of
68 physical deconditioning, even if women remain physically active. Women can
69 experience a reduction in cardiovascular fitness, muscle mass, strength and
70 endurance during pregnancy.^{2, 11, 12} Educating women about these physical changes
71 and the influence of lifestyle factors throughout the perinatal period is likely to be the
72 first step to engage them with postpartum rehabilitation.⁴ Other factors that influence
73 their physical condition after childbirth include, baseline physical conditioning,
74 biomechanical changes and birth experience.^{8, 13, 14} Like any period of relative
75 deconditioning, a period of re-conditioning should follow as is recommended within
76 physical activity guidance¹⁵ and return-to-sport injury models.¹⁶ For postpartum
77 women, this means gradually building up postpartum exercise, progressing intensity
78 and load as tolerated.^{6, 11, 15} It is essential that physical therapists understand the level
79 of strength and conditioning required to support the higher impact and intensity
80 involved in running and ensure that rehabilitation addresses any clinically identified
81 deficits.^{3, 6, 17} In addition, physical therapists should be alert to the possibility that when
82 postpartum women return-to-running, they risk overtraining if they engage in excessive
83 volume or intensity relative to their available energy reserve [see Relative Energy
84 Deficiency in Sport (RED-S)].

85 **Changes to body mass**

86 Body mass, often defined in terms of weight, weight management or Body Mass Index
87 (BMI), is an important consideration for evaluating postpartum risk of obesity and
88 guiding appropriate return-to-running. Obesity, defined by the National Institute of
89 Clinical Excellence¹⁸ as having a BMI ≥ 30 kg·m⁻², is a growing threat to women of
90 childbearing age^{19, 20} and can occur following pregnancy due to the associated
91 increases in body mass. On average, body mass will increase by 11 to 16 kg during
92 pregnancy^{21, 22} and by 3.2 kg postpartum.²² These body mass changes during
93 pregnancy can predict long-term body mass and future risk of obesity. Specifically,
94 women who lose pregnancy associated increases in body mass in the short-term are
95 likely to decrease their risk of long-term obesity, whilst maintaining the gain in
96 pregnancy-related body mass increases the risk of postpartum obesity.²³
97 Understanding body mass in relation to other considerations (e.g., sleeping patterns,²⁴
98 psychological wellbeing^{25, 26} and breastfeeding²⁴) is required as part of the clinical
99 reasoning process to ascertain contributory factors. Furthermore, due to high body
100 mass having potential long-term ramifications, it is important to monitor body mass in
101 all postpartum women.

102 Obese women are considered to have an increased risk of gestational diabetes,^{20, 27}
103 musculoskeletal injury²⁸ and pelvic floor dysfunction (PFD).²⁹ In addition, adipose
104 tissue is considered to cause systemic inflammation, which may influence the
105 underlying mechanisms of central pain processes, thereby increasing a woman's risk
106 of postpartum pain.³⁰ As a result, obese postpartum women planning to return-to-
107 running require a phased approach that initially targets weight management.²⁹
108 Fortunately, body mass is modifiable, with breastfeeding, dietary and physical activity
109 interventions leading to reduced excessive maternal body mass and improved health

110 related outcomes for the mother and infant.^{18-20, 24, 31-33} Additionally, breastfeeding is
111 proposed to offer anti-inflammatory properties by attenuating inflammation and may
112 be particularly protective for obese postpartum women.³⁰ This emphasizes the
113 importance of encouraging and supporting postpartum breastfeeding (see
114 Breastfeeding section). A phased approach could include lower impact exercise
115 options than running and may be considered more appropriate for obese postpartum
116 women until BMI is within normal range (18.5 – 24.9 kg·m⁻²).⁶ The importance of
117 supporting women in maintaining active pregnancies and gradually progressing back
118 into exercise postpartum should not be underestimated.

119 **Sleeping patterns**

120 Postpartum women experience alterations in sleep frequency, duration, quality and
121 routine, which can negatively impact physical and psychological recovery following
122 childbirth.³⁴ Specifically, sleep loss and disruption to the circadian rhythm³⁵ is related
123 to lower general health, increased stress,³⁶ disrupted glucose metabolism,³⁷
124 worsening immune response^{38, 39} and, impaired cognition,⁴⁰ memory and learning.⁴¹
125 Any disruption to sleep could also have adverse consequences for gastrointestinal
126 health³⁵ and psychological health via the gut-brain-axis,⁴² as circadian rhythms
127 regulate gastrointestinal physiology. There are also several muscle-related effects
128 associated with sleep loss, such as reduced protein synthesis, disrupted cell growth
129 and repair, and impaired maximal muscle strength.^{39, 43} Consequently, the physical
130 and psychological changes associated with sleep loss may delay postpartum tissue
131 healing, influencing physical conditioning and the risk of tissue injury when exposed
132 to running.

133 The negative ramifications of sleep disturbances potentially make returning-to-running
134 postpartum challenging and counter-productive. This is particularly evident when we

135 consider that exercise is important for gaining the necessary physical and
136 psychological health benefits that could otherwise be compromised by poor sleep.
137 Therefore, the level of physical exertion appropriate for postpartum women will likely
138 vary depending on other factors discussed within this commentary. For instance, it is
139 recognized that: 1) poor maternal sleep hygiene increases the risk for postpartum
140 anxiety and depression⁴⁴ (see Psychological wellbeing); 2) there will be a tipping point
141 whereby activity levels negatively influence sleep⁴⁵; and 3) poor sleep quality may
142 impact a woman's overall energy balance [(see Relative Energy Deficiency in Sport
143 (RED-S)] and levels of low back and pelvic pain.⁴⁶

144 Ideally, adults require 7 to 9 hours of sleep per night inclusive of deep, quality
145 intervals.⁴⁷ In addition, similar to recommendations within athlete populations,
146 engaging in a sleep routine that promotes the natural internal process of the body to
147 regulate sleep via the circadian rhythm means that adults should ideally sleep during
148 dark hours and awaken at sunrise.^{34, 35, 39} It is acknowledged that this is unrealistic
149 during early postpartum when the demands of the baby likely persist throughout the
150 night, especially if women are breastfeeding. However, as the baby's sleep duration
151 increases it is crucial that postpartum women prioritize their own sleep routine in order
152 to counter the negative ramifications of sleep loss. Furthermore, day-time naps are
153 frequently recommended to postpartum women to counteract sleep deprivation.⁴⁸
154 However, it is not as simple as expecting postpartum women to nap when the baby
155 naps and it also goes against promoting the natural circadian rhythm. Therefore,
156 increasing sleep duration in this cohort is challenging and the focus should be on
157 improving sleep quality. Fortunately, there are several changes that postpartum
158 women can readily implement to improve sleep quality, such as: regularly exercising,
159 consistent winddown routines, reduced stimulation from blue light, adopting cool

160 comfortable sleep environments and avoiding the consumption of alcohol or caffeine.⁴⁸
161 Overall, given the clear health benefits to having appropriate levels and quality of
162 sleep, physical therapists should acknowledge and understand how changes in
163 sleeping patterns may facilitate a more effective return-to-running and educate
164 postpartum women regarding sleep hygiene when appropriate.

165 **Breastfeeding**

166 At least 50% of postpartum mothers are breastfeeding at 6-8 weeks following
167 childbirth.^{49, 50} This is a similar timeframe to when postpartum women may seek
168 access to physical therapy to guide postpartum recovery and return-to-running. There
169 is a common misconception that breastfeeding increases the risk of injury during
170 running due to its hormonal influence.^{2, 51, 52} However, there are conflicting reports
171 regarding the overall influence of hormones on connective tissue, joint laxity and
172 tendons.^{30, 53, 54} While it is understood that hormones related to breastfeeding may
173 alter some bodily tissues,⁵⁵ the actual impact of their influence is not consistent
174 between individuals. Biomechanical research has suggested that postpartum runners
175 may compensate for joint laxity by restricting how they run.⁵⁶ In addition, generalized
176 joint laxity has been shown to alter foot loading patterns and possibly injury risk in
177 female athletes.⁵⁷ Therefore, it could be argued as part of a wider clinical evaluation,
178 physical therapists could screen postpartum runners for hypermobility impairments
179 using a standardized tool such as the Beighton's Score,^{9, 58, 59} especially in postpartum
180 women with pre-existing hypermobility conditions.⁵³ Physical therapists should be
181 cognizant of the fact the Beighton's Score predominantly tests upper limb joints,
182 whereas the risk evaluation for running relates to lower limb joints.⁵⁹

183 Consideration should also be given to the high caloric cost of breastfeeding⁶⁰ and the
184 risk that this may pose to postpartum women developing RED-S, especially if

185 adequate sleep, food, and fluid intake are not maintained. This is because both
186 breastfeeding and running are energy demanding and understanding how to maintain
187 their mutual benefits is important. Furthermore, women with adequate calorie intake
188 should be reassured that engaging in moderate to vigorous intensity exercise during
189 lactation does not demonstrate negative effects on milk volume, composition, or infant
190 development,¹³ nor does it impact acceptance of breast milk.⁶¹ Educating women
191 regarding the benefits of timing feeds before running, to prevent the breasts becoming
192 uncomfortably full, and wearing suitable breast support (Supplementary 1) is
193 important. In addition, waiting one hour after running before breastfeeding again may
194 ensure that the taste of the milk is unaffected.^{61, 62} Such considerations for navigating
195 return-to-running in women who are breastfeeding are important given that lactation
196 can create a barrier to exercise if women are not appropriately supported.⁶³

197 Physical therapists should be mindful of issues that women may encounter while
198 breastfeeding. Complications including mastitis or breast abscesses require
199 appropriate and timely management to avoid postpartum women becoming
200 systemically unwell and to safeguard their breastfeeding ability.⁶⁴ Additionally,
201 difficulties with lactation or milk let down may be a sign of thyroid autoimmunity (see
202 Postpartum fatigue and thyroid autoimmunity) and, although rare, clinicians should be
203 aware of the potential for pregnancy- and lactation-induced osteoporosis.⁶⁵ Depending
204 on the severity of such presentations, it may not be appropriate for postpartum women
205 to return-to-running, or progress running levels, until medical concerns are addressed.
206 Overall, current research highlights that breastfeeding and exercise offer substantial
207 benefits, with limited risk. Therefore, breastfeeding and breast health should be
208 considered and supported within clinical practice.

209 **Relative Energy Deficiency in Sport (RED-S)**

210 Previously referred to as the Female Athlete Triad Syndrome, RED-S refers to
211 impaired physiological functioning caused by relative energy deficiency including
212 impairments of metabolic rate, menstrual function, bone health, immunity, protein
213 synthesis and cardiovascular health.⁶⁶ In the context of postpartum runners, energy
214 imbalance can result from combining any number of the following considerations: daily
215 physical activity levels, nutritional intake, breastfeeding status, sleep quality and
216 running-related exertion. Clinicians should be particularly aware of postpartum women
217 overtraining by returning to excessive running volume or intensity or having low energy
218 reserves from high daily physical demands, breastfeeding and/or sleep deprivation.

219 Physical therapists can play an important role in identifying, signposting and assisting
220 the multidisciplinary management of postpartum RED-S and should therefore be
221 aware of identifiable risks factors and symptoms. It is crucial that key symptoms are
222 evaluated alongside the physical demands of postpartum women. Key symptoms
223 include: amenorrhoea, sleep disturbances, compromised psychological wellbeing,
224 stress fractures and PFD.⁶⁶⁻⁶⁸ Postpartum women should also be informed about these
225 signs and symptoms and the importance of seeking help. A clinical screening tool,
226 such as the RED-S CAT, may provide a useful proforma to assess for RED-S within
227 clinical practice.⁶⁹

228 **Postpartum fatigue and thyroid autoimmunity**

229 Postpartum women can present with fatigue or compromised energy levels following
230 childbirth. This could be attributed to several factors discussed within this clinical
231 commentary including physical deconditioning, sleeping patterns, RED-S or
232 psychological wellbeing. However, physical therapists serving postpartum women
233 should also be aware of potential thyroid autoimmunity in this population⁷⁰.

234 Specifically, because the late detection of thyroid autoimmunity, has been suggested
235 to cause a multitude of complications including persistent hypothyroidism.⁷¹ However,
236 there remains a scarcity of research on this topic.

237 Different types of autoimmune thyroid disease present during and following
238 pregnancy. One such example is Postpartum Thyroiditis (PPT), referring to thyroid
239 dysfunction within the first year after childbirth or miscarriage, when the
240 immunosuppressive effect of pregnancy disappears. Presenting symptoms of PPT are
241 similar to symptoms commonly seen in women with postpartum depression⁷² and
242 include fatigue, palpitations, heat intolerance, and irritability. Additional indicators of
243 PPT include impaired memory or concentration, dry skin, generalized aches and
244 pains, cold intolerance, hair changes, and difficulty losing weight. In addition, both
245 hyperthyroidism and hypothyroidism can impact milk let-down and the ability to
246 successfully breastfeed, highlighting that it is an important differential diagnosis when
247 considering breastfeeding difficulties.⁷² Furthermore, although exercise is generally
248 considered to be beneficial for thyroid conditions, poorly controlled PPT may risk
249 cardiovascular complications and should be approached with caution until medical
250 concerns are managed.^{73, 74}

251 **Fear of movement**

252 If postpartum women are struggling to return-to-running, a potential concern may be
253 fear associated with the movement itself, termed fear of movement (FOM).⁴ Derived
254 from the fear-avoidance model, FOM is a psychosocial construct that focuses on pain-
255 related fear associated with physical activities.⁷⁵ Evidence shows a high FOM is
256 negatively associated with return-to-sport following musculoskeletal injury.⁷⁶ In the
257 postpartum population FOM during the healing time may actually be a protective action
258 to avoid behaviour, such as running, which could be detrimental to recovery.⁷⁷

259 However, if this fear persists beyond the healing time it could be maladaptive and lead
260 to women not returning-to-running⁴ or altering movement patterns to protect the
261 body.⁷⁸ For example, postpartum women appear to prioritise gait stability by restricting
262 trunk and pelvis motion, whilst increasing ground contact time and step width during
263 running.⁵⁶ Such gait alterations may be a protective strategy based on heightened
264 FOM. It is therefore imperative that any FOM is addressed early during postpartum
265 rehabilitation. Management will vary depending on individual needs and may include
266 strength and conditioning, graded exposure, support wear such as compression
267 garments or appropriate footwear (Supplementary 1), and multidisciplinary
268 signposting. Clinicians are recommended to use the 11 item Tampa Scale for
269 Kinesiophobia⁷⁹ to assess FOM in postpartum women. It is important to note, that FOM
270 is only one psychological factor, but there are likely to be several that play a role, such
271 as self-efficacy and personality traits, which require further research.

272 **Psychological wellbeing**

273 Fundamentally, screening for compromised perinatal psychological wellbeing is
274 essential as it is estimated that 50% of women suffering poor perinatal mental health
275 remain undiagnosed.⁸⁰ Symptoms include reduced quality of life, anxiety, lack of life
276 interest, tearfulness, insecurity, inappropriate obsessional thoughts, irritability, fatigue,
277 guilt, fear of harming the baby and a reluctance to breastfeed.⁸¹

278 A more specific maternal psychological wellbeing issue that is being increasingly
279 recognized is birth trauma. Birth trauma refers to severe psychological distress
280 because of actual or perceived trauma or threat during childbirth.⁸² The risk of birth
281 trauma can be increased due to the following medical situations: instrumental
282 deliveries, emergency caesarean-sections, inadequate pain relief and
283 preeclampsia.^{83, 84} In addition, a seemingly *normal* childbirth may also be

284 experienced as traumatic due to perceived harm or loss of control.⁸⁵ Other risks for
285 birth trauma include low socioeconomic background and psychosocial factors.⁸⁶

286 Birth trauma can manifest through several physical and psychological symptoms.⁸⁷
287 Physical symptoms of birth trauma include birth related tissue injury, fatigue, reduction
288 in functional capacity and persistent postpartum pain.^{86, 88} Psychological indications
289 present as signs similar to post-traumatic stress disorder and include traumatic
290 memory, negative cognition, escape behavior, suicidal thoughts,⁸⁹ relationship
291 difficulties⁹⁰ and maternal attachment issues. Depending on the physical therapist's
292 skillset, implementing evidence informed coping strategies into rehabilitation may be
293 beneficial for long-term management and promotion of maternal psychological
294 wellbeing. Current evidence suggests the following may be beneficial: mindfulness,⁹¹
295 relaxation⁹² or cognitive behavioural therapy approaches.⁹³ It is important that physical
296 therapists screen for psychological wellbeing using an appropriate validated tool, such
297 as the Edinburgh Postnatal Depression Scale⁹⁴ or the Clinician Administered Post-
298 Traumatic Stress Disorder Scale⁹⁰ and signpost to specialists where indicated.

299 From a return-to-running perspective, postpartum women may use running as a
300 coping strategy for birth trauma as well as for perinatal psychological health, managing
301 body mass, body image or escapism.^{95, 96} Postpartum women who present with a
302 craving for running, resulting in uncontrollable, excessive exercise behavior, may be
303 at risk of overtraining, RED-S, injuries and impaired social relations.⁹⁷ Therefore,
304 physical therapists should be aware of signs of excessive and obsessive exercise
305 beliefs and behaviours and signpost women to specialist support services as
306 appropriate.

307 **Socioeconomic considerations**

308 Supporting women from lower socioeconomic backgrounds to return-to-running is
309 particularly relevant given that it is an accessible and cost-effective form of exercise
310 and they are at greater risk of many of the health implications discussed within this
311 clinical commentary. For example, women from lower socioeconomic backgrounds
312 have a greater risk of gestational obesity,⁹⁸ birth trauma⁹⁹ and postpartum persisting
313 pain⁸⁶ than women from higher socioeconomic settings. Other factors contributing to
314 such adverse health outcomes are poor living conditions, overcrowding, and poor
315 nutrition. In addition, it is acknowledged that fewer health initiatives tackling obesity
316 are targeted at lower socioeconomic populations.⁹⁸ Physical therapy management of
317 postpartum women from low socioeconomic backgrounds may include social
318 prescribing and multidisciplinary collaboration to support them in returning to, and
319 maintaining, a long-term healthy and active lifestyle. Therefore, identifying women who
320 have a low socioeconomic background and recognizing the need to create awareness
321 of physical activity guidelines and public health campaigns (e.g., Better Health or
322 Tackling Obesity¹⁰⁰) is important when assessing and evaluating readiness to return-
323 to-running postpartum.

324 **Discussion**

325 This clinical commentary highlights the importance of considering postpartum return-
326 to-running using an individualized, whole-systems, biopsychosocial approach that
327 goes beyond examining the musculoskeletal system. By reframing postpartum return-
328 to-running as an active process requiring rehabilitative support similar to return-to-
329 sport injury models, rather than a natural healing process requiring no support, we
330 hope that postpartum rehabilitation becomes the norm rather than the exception.

331 Whilst, each consideration has been discussed in turn, the interactions between
332 considerations should be acknowledged. This requires an appreciation for how the
333 psychological considerations can manifest in physical symptoms and/or behaviors,
334 such as heightened FOM leading to women not returning-to-running. In addition, the
335 converse can also be true, physical considerations may affect psychological wellbeing,
336 such as an emergency caesarean-section leading to trauma related psychological
337 distress. Further, the ramifications of postpartum sleep loss highlight clear interactions
338 between physical and psychological processes. The importance of having a whole-
339 systems understanding to postpartum care is also highlighted when we consider the
340 impact of postpartum obesity. Specifically, understanding that increased body mass is
341 not solely related to the mechanics of carrying and supporting extra mass, but also
342 influential to the inflammatory pathophysiology of abdominal obesity and its associated
343 sequelae.³⁰ Therefore, we recommend that physical therapists move beyond using a
344 reductionist musculoskeletal approach for postpartum return-to-running and instead
345 examine whole-systems.

346 When managing postpartum women seeking to return-to-running, a risk-benefit
347 analysis should be undertaken to determine their suitability for running. To help guide
348 clinical reasoning we have outlined the key whole-systems considerations that can be
349 used by physical therapists (Table 1). Balancing the need to support women in
350 maintaining exercise without compromising physical and psychological wellbeing is
351 the aim of the clinical reasoning process. However, it is important to note that individual
352 cases can present conflicting clinical indications with regards to physical and
353 psychological health. We have presented two postpartum scenarios applying our
354 clinical reasoning to the risk-benefit analysis within a whole-systems biopsychosocial
355 model (Supplementary 2). The scenarios also include musculoskeletal factors typically

356 considered in postpartum recovery, but it is beyond the scope of this clinical
357 commentary to discuss them in detail.

358 *(Insert Table 1 here)*

359 The biopsychosocial implications of the recent Covid-19 global pandemic on women's
360 health and wellbeing cannot be overlooked.¹⁰¹ It is essential that the impact of social
361 isolation and the unprecedented restriction of service provision¹⁰² on the physical and
362 psychological wellbeing of postpartum women during a transitional life phase is duly
363 considered. Postpartum women presenting to physical therapy may have been
364 negatively impacted by the cessation of health, social and leisure services or the
365 ongoing service redesigns following the pandemic. This may place them at a
366 heightened risk for many of the considerations discussed within this commentary and
367 clinicians should be mindful of the associated impact it may have on postpartum
368 recovery. Consequently, the possible biopsychosocial implications of the global
369 pandemic should be considered as part of an individualized, clinically reasoned, risk-
370 benefit analysis.

371 In summary, the evaluation and management of postpartum women returning-to-
372 running requires an individualized approach with graded exercise progression, which
373 is similar to how return-to-sport is managed for musculoskeletal injuries. It is essential
374 that a risk-benefit analysis is undertaken using a whole-systems approach, which
375 moves beyond standard musculoskeletal considerations. Recognizing the importance
376 of possible interactions between considerations within a biopsychosocial model will
377 facilitate holistic management of postpartum women and can be used to inform
378 readiness to return-to-running.

379

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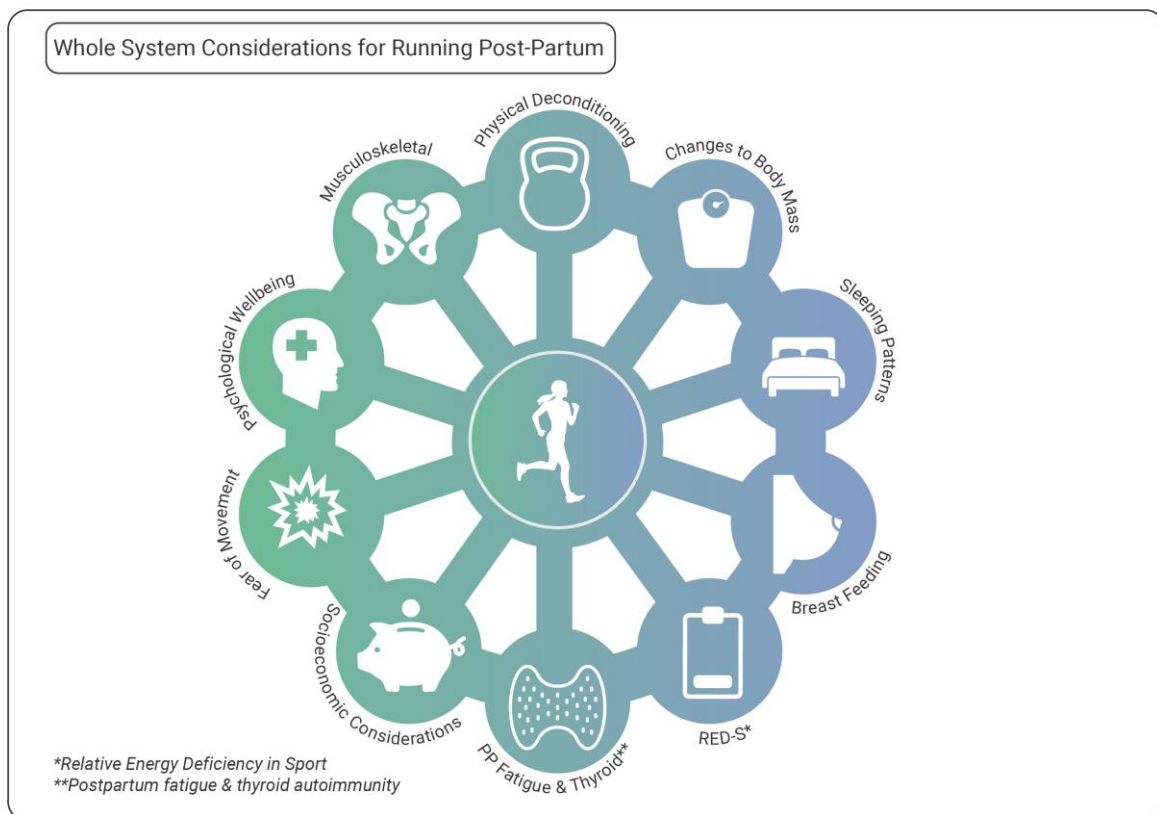
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653 *Figure 1. Schematic representation of whole-systems considerations*

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656 *Table 1. Key clinical considerations for managing postpartum return-to-running using*
 657 *a whole-systems approach*

Key Clinical Reasoning Questions	Outcome
1. Are there signs of physical deconditioning?	Yes / No
2. Is BMI > 30	Yes / No
3. Is sleep quality an issue?	Yes / No
4. If breastfeeding are there any concerns, breast pain or unexplained lumps?	Yes / No
5. Is joint hypermobility present? (Beighton Score >5/9 as part of a wider clinical evaluation)	Yes / No
6. Using REDS-CAT, does she present with signs of RED-S	Yes / No
7. Are there signs of postpartum fatigue or potential postpartum thyroiditis?	Yes / No
8. Using 11-item Tampa Scale for Kinesiophobia have you highlighted any FOM?	Yes / No
9. Is running being used as a coping strategy?	Yes / No
10. Have you identified signs of postpartum depression/negative mental health/birth trauma? (consider Edinburgh Postnatal Depression Scale or Clinician Administered PTSD Scale)	Yes / No
11. Did you identify a lower socioeconomic background?	Yes / No
12. Are there concerns related to musculoskeletal recovery?	Yes / No
Total number of 'Yes' outcomes needing clinical consideration	/ 12

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