# Multidisciplinary, biopsychosocial factors contributing to return to running and running related stress urinary incontinence in postpartum females

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## Abstract

**Objectives:** To examine contributory factors behind postpartum return-to-running and return to pre-pregnancy running level, in addition to risk factors for postpartum running-related stress urinary incontinence (SUI).

**Methods:** 881 postpartum females completed an online questionnaire. Clinically and empirically derived questions were created relating to running experiences and multidisciplinary, biopsychosocial contributory factors. Logistic regression was used to determine predictors for return-to-running, returning to pre-pregnancy level of running, and running-related SUI.

**Results:** Median time to first postpartum run was 12-weeks. Running during pregnancy (OR: 2.81 [1.90 – 4.15]), a high running volume (OR: 1.79 [1.22 – 2.63]), lower fear of movement (OR: 0.53 [0.43 – 0.64]) and not suffering vaginal heaviness (OR: 0.52 [0.35 – 0.76]) increased the odds of return-to-running. Factors that increased the odds of returning to pre-pregnancy running level were a low running volume (OR: 0.38 [0.26 – 0.56]), having more than one child (OR: 2.09 [1.43– 3.05]), lower fear of movement (OR: 0.78 [0.65 – 0.94]), being younger (OR: 0.79 [0.65 – 0.96]) and shorter time to running after birth (OR: 0.74 [0.60 – 0.90]). Risk factors for running-specific SUI were having returned to running (OR: 2.70 [1.51 – 4.76]) and suffering running-specific SUI pre- (OR: 4.01 [2.05 – 7.82]) and during pregnancy (OR: 4.49 [2.86 – 7.06]); having a caesarean delivery decreased the odds (OR: 0.39 [0.23 – 0.65]).

**Conclusion:** Running during pregnancy may assist females safely return-to-running postpartum. Fear of movement, the sensation of vaginal heaviness and running-specific SUI before or during pregnancy should be addressed early by a healthcare provider.

**Key words:** fear of movement, running volume, pregnancy, risk factors

## Introduction

Running has several physical and mental health benefits[1]. Female engagement with running is increasing and is a common activity in postpartum females[2, 3], given its ease of access and minimal financial and social constraints. However, there is a high prevalence of musculoskeletal injuries associated with running[4] and the repetitive, high impact nature of running may expose females to pelvic health issues, such as stress urinary incontinence (SUI)[5, 6]. Given the physical changes that occur during pregnancy and childbirth[7-9], there is growing recognition for the need to rehabilitate postpartum females prior to returning to running, in a similar manner to rehabilitating musculoskeletal injuries.

Adopting a multidisciplinary, biopsychosocial injury rehabilitation model, by including medical, biomechanical, physiological and psychological factors, is advocated for postpartum return to high impact activities[10, 11]. A recent Delphi study[12] identified potential risk factors for postpartum females returning to running, such as running too soon following childbirth, suffering from pain and having pelvic-related trauma. Pregnancy and postpartum pain in the lower back and pelvis is common and may result from altered musculoskeletal loading that manifests through changes in walking and running gait[13, 14]. However, it is unknown if postpartum runners present with similar painful body areas. In addition, pelvic floor trauma and/or dysfunction may be indicated by the sensation of vaginal heaviness[11], which could be exacerbated by returning to running. Psychologically, fear of movement has been associated with restricted postpartum physical activity and a caesarean delivery[15, 16], highlighting the importance of considering readiness to return-to-running within a biopsychosocial model of care. However, to-date, there are no empirically identified modifiable or non-modifiable multidisciplinary contributory factors for successfully returning to running postpartum or returning to pre-pregnancy running level. Such an understanding will enable clinicians to better implement targeted rehabilitation interventions and provide effective postpartum care. In addition, it will improve prenatal education and empowerment of pregnant and postpartum females.

One condition suffered by runners and postpartum females is SUI, which refers to urine leakage upon exertion[17, 18]. Under the broad umbrella of SUI, prevalence amongst runners varies from 19 to 40%[5, 6, 19] and postpartum females are at a greater risk of SUI than nulliparous females and males[20, 21]. Alongside giving birth and being female, suggested risk factors are increasing age, having a vaginal delivery, pregnancy SUI and partaking in high impact activities[5, 17, 21-24]. Further, parous women are more likely to begin leaking urine during pregnancy than nulliparous women, indicating that females with multiple children may be at a greater risk of SUI postpartum[23]. It is conceivable that the physical changes during pregnancy and childbirth, coupled with returning to running too soon or with inadequate postpartum rehabilitation could increase the SUI risk, particularly during running. Yet, risk factors for running-specific SUI within the postpartum female running population are unknown.

The limited attention given to the postpartum population within the field of sports medicine and science means evidence-informed return-to-running postpartum guidelines are lacking[10, 25]. Therefore, the aim of this study was to examine contributory factors behind postpartum return-to-running and return to pre-pregnancy running level, in addition to risk factors of postpartum running-related SUI using a multidisciplinary, biopsychosocial approach. A secondary aim was to investigate running-related pain in terms of body area and severity.

## Methods

*Participants*

A total of 881 females (age 33.7 ± 3.6 years; median number of children: 1 (range: 1 – 6); time since childbirth: 314 ± 195 days) completed an online survey after providing voluntary,

informed consent. Females had to be over the age of 18, within two years of giving birth and have run at least once a week pre-pregnancy to be eligible for the study. Females who had returned to running > 52-weeks postpartum were excluded to minimise the effect of recall bias on time to first run postpartum. Ethical approval was obtained from the University's Ethics Committee. All data were anonymised and stored on a General Data Protection Regulation (GDPR) compliant, online system that only the research team had access to.

*Survey*

A cross-sectional online, open questionnaire was developed by pelvic health physiotherapists (EB, GD, JP) and human movement experts (IM, MJ) using round-table discussions. Clinically and empirically derived questions on the experiences of postpartum female runners and multidisciplinary, biopsychosocial contributory factors were created. Patients and the public were not involved in the design of this study. The questionnaire was piloted amongst a small group of postpartum runners to test usability, whilst computer and mobile phone functionality was tested within the survey software (Qualtrics; www.qualtrics.com; version June 2020) and with the pilot group. A bespoke survey website address was generated by the survey software and distributed via social media channels (Facebook, Instagram and Twitter) by several co-authors (IM, MJ, EB, JP and GD) and was available from June 2020 until September 2020. The following topics were included: demographics, delivery mode, perineal tears, concern for the sensation of vaginal heaviness/pressure, running-levels postpartum and whether they had reached pre-pregnancy running level (Supplementary 1). Running level was described as the volume of running training. The average number of miles ran each week were reported by each participant and the median was used to split participants into low (<10 miles; 45%) and high (≥ 10 miles; 55%) groups. Females were asked about urine leakage pre, during and post-pregnancy and during which activities leaking occurred. Only females who reported leaking urine whilst running were categorised as having *running-specific SUI.* To assess fear of movement, an 11-item, modified Tampa Scale for Kinesiophobia was used[26]. This measure has been shown to be associated with postpartum disability levels[27] and returning to sport following a musculoskeletal injury[28]. Items were scored from 1 (strongly disagree) to 4 (strongly agree), meaning total fear of movement (sum of all items) ranged from 11 to 44. Higher scores indicate greater fear. Item 5 was adapted to suit the population of interest, with the word *childbirth* replacing *accident*. Musculoskeletal pain when running postpartum was assessed on a 0 (no pain) to 10 (severe pain) visual analogue scale for the following regions: breast, thoracic, abdominal, pelvis, lower back, coccyx and lower limb. Total pain was the sum of all pain reported for each region (maximum total pain = 70). Participants were also asked whether they perceived they had changed their running gait since giving birth. No incentives were provided to participants for completing the questionnaire. Due to logical ordering required for certain items of the questionnaire no randomisation of the item ordering occurred. Several questions referred to postpartum running or urine leakage, which were only provided to participants if they had returned to some level of postpartum running or had leaked urine, respectively. As a result of adaptive questioning the number of items and screens varied. The range for number of items was 13 - 20 and for screens was 6 to 7. It should be noted that only the questions relating to the aims of this specific study have been included. Completion of items was enforced using Javascript and participants were able to review and change their answers as they progressed by the use of a Back button.

*Data preparation and statistical analysis*

Only participants who met the inclusion criteria and completed all of the study's questions were used in further analysis. Based on the number of participants who consented (n=1410) there was a completeness rate of 62.5%. Given the possibility of having more than one mother with the same IP address, duplicates were checked based on IP address and age. No duplicates were recorded in the data. Means (SD), medians (IQR) and proportions were

calculated. Logistic regressions were performed using the *statsmodels* package to assess the contributory factors to three different outcome measures: return-to-running (yes, no), return to pre-pregnancy running level (yes, no) and running-related SUI (yes, no). The continuous independent variables were: age, fear of movement, total pain and time to first run postpartum run. The categorical independent variables were: ran during pregnancy (yes, no), running volume (high, low), delivery mode (vaginal, caesarean), parity (one child, two or more children), vaginal heaviness (yes, no), perineal tear (no, 1$^{st}$ degree or 2$^{nd}$ degree, 3$^{rd}$ degree) and, running-specific SUI for pre, during and post-pregnancy (yes, no). Multicollinearity was checked using a threshold of 0.45 and urine leakage pre, during and post-pregnancy were removed due to being related to running-specific urine leakage pre, during and post-pregnancy respectively. Continuous variables were mean-centered before being entered into regression models. The time between completing the survey and childbirth was reported as "time since childbirth". The time since childbirth ranged from 1 to 104 weeks and may be a potential confounding factor. Therefore, the effect of time since childbirth was controlled for by computing logistic regression models with and without time since childbirth and accuracy, sensitivity, specificity and the area under the receiver operator characteristic curve (AUC) recorded. The AUC was determined using the *sklearn* package. Odds ratios (95% confidence intervals) were calculated by taking the exponent of the regression model estimates. A Mann-Whitney U test compared pain levels in those that had multiple pain sites and those who did not, in addition to those that had and had not perceived a change in gait due to the non-normality of data. Alpha level was set at $\leq 0.05$ and all statistical analysis was undertaken using Python (Python Software Foundation).

## Results

The majority of females (74%; n=654) had returned to running (Table 1). Of those that returned, 36% (n=238) had returned to their pre-pregnancy running level (Table 2) and the median time to their first postpartum run was 12-weeks (IQR: 7 – 20). Postpartum running-specific SUI had a prevalence of 29% (Table 3).

*Postpartum return-to-running*

Running during pregnancy, a high running volume and lower fear of movement increased the odds of return-to-running postpartum, whilst suffering vaginal heaviness reduced the odds (Figure 1). Removing time since childbirth did not change these findings (Supplementary 2 Table 1). Good prediction performance was observed with time since childbirth included (accuracy: 75%; sensitivity: 89%; specificity: 35%; AUC: 0.88) and removed (accuracy: 73%; sensitivity: 88%; specificity: 31%; AUC: 0.87).

*Postpartum return to pre-pregnancy running level*

Factors that increased the odds of returning to the pre-pregnancy level of running were having a low running volume, more than one child, a lower fear of movement, being younger and a shorter time to first postpartum run (Figure 2). Removing time since childbirth meant age was no longer significant (Supplementary 2 Table 2). The return to pre-pregnancy level of running model had poor accuracy, both with time since childbirth included (accuracy: 38%; sensitivity: 57%; specificity: 27%; AUC: 0.90) and removed (accuracy: 22%; sensitivity: 13%; specificity: 28%; AUC: 0.83).

*Postpartum running-related SUI*

Greater odds of experiencing running-specific SUI were observed for having returned to running and suffering running-specific SUI pre- and during pregnancy (Figure 3), whilst a caesarean delivery decreased the odds. Removing time since childbirth did not change these findings (Supplementary 2 Table 3). The regression model had poor accuracy, but high

sensitivity when time was included (accuracy: 28%; sensitivity: 71%; specificity: 12% AUC: 0.95) and excluded (accuracy: 27%; sensitivity: 78%; specificity: 6%; AUC: 0.96).

*Pain*

Eighty-four percent of those that had returned to running had pain in at least one body area, with the median level of total pain being six (IQR: 3 - 11). The majority (76%, n=420) experienced pain in more than one body area, with 50% experiencing pain in three or more areas. Those that experienced pain in multiple body areas had greater pain levels than those that experienced pain in one body area (median pain: 7 [5 – 13] vs. 2 [1 – 4], respectively, $U=6398$, $p < 0.001$). The lower limb was the most prevalent body area (78.6%), followed by the lower back (53.3%), pelvis (52.7%), abdomen (35.7%), breasts (31.0%), thoracic (24.1%) and coccyx (20.5%). Additionally, those who reported a change in running gait had higher running-related pain than those who did not report such a change (6 [3 – 12] vs. 4 [1 – 7], respectively, $U=37646$, $p < 0.001$).

## Discussion

This study aimed to examine factors that contribute to postpartum return-to-running, return to pre-pregnancy running level and running-specific SUI using a multidisciplinary, biopsychosocial approach. A lower fear of movement increased the odds of both return-to-running and returning to pre-pregnancy running level postpartum. Running during pregnancy, a high running volume and not suffering from vaginal heaviness also increased the odds of return-to-running postpartum, whilst a low running volume, having more than one child, being younger and a shorter time to first postpartum run also increased the odds of returning to pre-pregnancy running level postpartum. Returning to running, having a vaginal delivery and suffering running-specific SUI pre- and during pregnancy increased the odds of having running-related SUI. To the authors' knowledge, this was the first study to apply a multidisciplinary, biopsychosocial approach to, and identify contributory factors for, women returning to running postpartum.

*Factors contributing to postpartum return-to-running*

Continuing to run during pregnancy and having a high running volume pre-pregnancy increased the odds of return-to-running postpartum. These two contributory factors may be associated, as Tenforde and colleagues[29] reported that running during pregnancy was accompanied by higher running volume pre-pregnancy. Yet females are often concerned about causing harm to their baby, which can stop engagement with running[30]. However, running and/or aerobic exercise during pregnancy is not associated with an increased risk of preterm birth or reduction in gestational age at delivery[31, 32]. It is therefore essential that clear messages are provided to pregnant females regarding the benefits of exercise and guidelines are updated to reflect empirical evidence[33]. Whilst having a high running volume increased the odds of postpartum return-to-running, it decreased the odds of returning to pre-pregnancy running level. This may reflect high volume runners following clinical recommendations and gradually returning to running[2, 10, 11, 34]. Additionally, females who took longer to complete their first run following childbirth and those with only one child had lower odds of returning to pre-pregnancy running levels within 12-months. This further supports the indication that females are gradually increasing their running volume and could also suggest that prior postpartum experience is beneficial to recovery.

The sensation of vaginal heaviness, rather than known physical traumas (perineal tears) was found to decrease the odds of return-to-running postpartum. This may be a consequence of runners being unaware of whether they have suffered a perineal tear and to what degree, whilst vaginal heaviness is a sensation that they are able to feel. The sensation of vaginal heaviness may indicate the presence of pelvic organ prolapse (POP)[35]. High-impact activities,

such as running, theoretically may increase the susceptibility of POP occurrence, due to the repeated exposure to load transmitted to the pelvic floor[24, 25]. Empirically, few studies have investigated high impact activities and POP, however, light-to-moderate intensity exercise has been shown to increase the severity of POP without increasing symptoms[36]. Based on our findings, the sensation of heaviness could be used as an indicator by clinicians that further examination is required as it was a barrier to returning to running postpartum.

Perineal tears not influencing returning to running may be explained by the median time to return-to-running being 12-weeks. Encouragingly, this median timeframe aligns with clinical guidelines[11] and IOC consensus recommendations[37] and differs from previous findings, showing that 49% of female runners returned within 6 weeks[5]. At 12 weeks, it is conceivable that adequate tissue healing had occurred, allowing females to successfully return-to-running even if they were unaware of any perineal tearing. Within sport, muscle tears are common and vary in severity[38], but are rarely career-ending. Therefore, whilst returning to running postpartum needs to consider more than perineal tears due to the possible disruption to pelvic organs[39], similar to sports muscle injuries, perineal tears should not be deemed a barrier to return-to-running following adequate healing time.

In support of previous findings in returning to sport post-ACL reconstruction, having a lower fear of movement increased the odds of return-to-running postpartum and returning to pre-pregnancy running level[40]. Interestingly, the fear of movement in postpartum females who had not returned to running is higher than individuals who have had ACL reconstructions[40], but similar to those suffering chronic low back pain and osteoarthritis[41]. One explanation could be the clear pathway for, and engagement with, rehabilitation in the ACL reconstruction patients[40], which contrasts with chronic low back pain[41], osteoarthritis[42] and postpartum patients who were not engaged in rehabilitation. By situating pregnancy and childbirth within a fear-avoidance model, we have been able to identify a contributory factor (fear of movement) that may be a barrier to some females being able to return-to-running and pre-pregnancy running level. Additionally, total pain was not a contributory factor to returning to pre-pregnancy running level. Clinically, knowing pain levels is important for possible indications of pathology, but our findings suggest that fear of movement should also be addressed in postpartum care.

*Postpartum running-related SUI risk factors*

Similar to previous research, 29% of females experienced postpartum running-related SUI[17, 43]. Further, those who had returned to running postpartum had greater odds of suffering running-related SUI than those who had not. Females with running-related SUI, who had not returned to running, represent those that will have attempted to run and decided against continuing. This lends support to high impact activities being a risk factor for SUI[21, 24, 44], although running volume did not contribute to the running-related SUI model and contradicts this. Greater understanding of high-impact exposure over a female's lifetime, incorporating mechanical loading, is needed to discern whether accumulated exposure to high-impact is a risk factor for SUI. However, with females still running whilst leaking urine, SUI was not a barrier for the majority of our cohort.

In support of past research, a history of SUI pre- and during pregnancy, as well as a vaginal delivery, increased the odds of suffering from SUI following childbirth[5, 21-23]. Similar to previous research, assisted and unassisted vaginal deliveries were included in the same group. Treating these vaginal deliveries as separate groups did not change the findings, specifically, both types of vaginal delivery increased the odds of running-specific SUI compared to caesareans. This highlights that both broad SUI and movement specific SUI in the postpartum population have several non-modifiable risk factors. The lack of significance for the modifiable

risk factors, such as training volume, fear of movement or time to first run indicate that early prevention is warranted in nulliparous and pregnant females. Specifically, strategies such as pelvic floor muscle training are advised[45].

*Running-related pain*

Eighty-four percent of females who had achieved postpartum return-to-running experienced pain, with three-quarters reporting more than one painful body area. Those that reported multiple body areas had a higher level of pain severity than those who reported one area. This constellation of pain in several body areas in the postpartum population is not unique to running, as it also presents during daily living[46]. Pelvic and lower back pain are consistently reported during pregnancy[47] and postpartum[48], yet, the lower limb was the most prevalent pain site in our study and appears to be specific to the postpartum running population. The lower limb is commonly injured in runners[4] and may be a result of loading the body too early[12], pregnancy-related structural changes or altered biomechanics, as those that perceived their gait had changed had higher pain in the current study. Conversely, pain may cause females to change their running gait, yet postpartum gait changes have been observed in the absence of pain[14]. Whilst, this study cannot establish a cause-and-effect relationship between gait and pain, it may indicate that postpartum rehabilitation should consider gait retraining to alleviate lower limb pain[49]. We were unable to determine if females had attempted to return-to-running and stopped due to pain. Given the high prevalence of pain in our cohort, it is recommended that postpartum care consider exercise-related pain and advise females accordingly about exercise re-engagement. Specifically, addressing any normalisation of pain and educating females on running-related injury risk factors, such as running volume and intensity progression[50].

*Limitations and strengths*

This retrospective study enabled a large cohort to be recruited, but meant pre-pregnancy SUI, during pregnancy SUI and time since first run answers may have been prone to recall bias. Predicting return-to-running postpartum had the highest accuracy and specificity, whilst both returning to pre-pregnancy running level and running-related SUI had lower accuracy and specificity. Further factors need to be considered for these models to improve, such as lifetime training exposure and pelvic floor assessments. Whilst a multidisciplinary, biopsychosocial approach was used in this study, not all factors could be considered and objective, physical tests could not be conducted. Such tests are likely to play a role in a return-to-running postpartum rehabilitation pathway[10, 11] and require further investigation. Fourth grade tears were not examined in this study due to the low prevalence (0.1%)[51], but may warrant attention in future research. Running volume was reported pre-pregnancy and postpartum, but running intensity was not. Therefore, although runners may have returned to their pre-pregnancy running volume, they may not have achieved a similar level of performance. Performance-related contributory factors should be explored in future research.

## Conclusion

In summary, several modifiable and non-modifiable factors contributing to return-to-running postpartum were identified using a multidisciplinary, biopsychosocial approach. Having a lower fear of movement increased the odds of returning to running and returning to pre-pregnancy running levels postpartum. Running whilst pregnant, a high running volume and not experiencing vaginal heaviness also increased the odds of returning to running, whilst a low running volume, having more than one child, being younger and a shorter time to first postpartum run increased the odds of returning to pre-pregnancy running levels. To support females to have active postpartum lifestyles and a safe return-to-running, healthcare providers are advised to encourage continued engagement with running during pregnancy, where it is safe to do so, and to address fear of movement and the sensation of vaginal heaviness. Risk

factors for running-related SUI indicate early intervention is warranted before and during pregnancy.

## What are the new findings?

- On average, females returned to running at 12-weeks postpartum and 84% experienced pain in the lower limb, lower back, pelvis, abdomen, breasts, thoracic or coccyx whilst running
- Running during pregnancy, lower fear of movement, high running volume pre-pregnancy and no vaginal heaviness increased the odds of returning to running postpartum
- A low running volume pre-pregnancy, lower fear of movement, having more than one child, being younger and shorter time to running after birth increased the odds of returning to pre-pregnancy running level
- Suffering from running-specific stress urinary incontinence pre-pregnancy and during pregnancy, having returned to postpartum running and having a vaginal delivery increased the odds of suffering from running-specific stress urinary incontinence postpartum

## How might it impact on clinical practice in the future?

- Prenatal healthcare providers should encourage females to stay engaged in running where appropriate and address pelvic floor dysfunction
- Assessing fear of movement and considering ways to reduce fear may help return females back to running
- The sensation of vaginal heaviness, rather than having a perineal tear, is a barrier to return-to-running postpartum
- Postpartum care should consider exercise-related pain and advise females accordingly about exercise re-engagement

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*Table 1. Means (SDs) and proportions (n) of each factor for those that had returned to postpartum running and those who had not*

| **Factors** | **Returned to running (n=654)** | **Not returned to running (n=227)** |
|---|---|---|
| Age | 33.8 (3.6) | 33.4 (3.6) |
| Median number of children | 1 | 1 |
| Time since most recent birth (days) | 354 (191) | 199 (159) |
| Fear of movement | 21 (6) | 26 (6) |
| Delivery mode | | |
| Vaginal (unassisted and assisted) | 73.7% (n=482) | 82.4% (n=187) |
| Caesarean | 26.3% (n=172) | 17.6% (n=40) |
| Perineal tear | | |
| No | 50.9% (n=333) | 44.1% (n=100) |
| 1st or 2nd degree | 41.9% (n=274) | 44.1% (n=100) |
| 3rd degree | 7.2% (n=47) | 11.8% (n=27) |
| Vaginal heaviness | | |
| No | 68.5% (n=448) | 47.6% (n=108) |
| Yes | 31.5% (n=206) | 52.4% (n=119) |
| Running mileage | | |
| Low | 41.0% (n=268) | 56.8% (n=129) |
| High | 59.0% (n=386) | 43.2% (n=98) |
| Postpartum running-specific SUI | | |
| No | 67.3% (n=440) | 81.9% (n=186) |
| Yes | 32.7% (n=214) | 18.1% (n=41) |

*Table 2. Means (SD) and proportion (n) of each factor for those that had returned to their pre-pregnancy level of running and those that had not*

| **Factors** | **Returned to pre-pregnancy level (n=238)** | **Not returned to pre-pregnancy level (n=416)** |
|---|---|---|
| Age | 33.7 (3.7) | 33.9 (3.6) |
| Median number of children | 2 | 1 |
| Time to first postpartum run (weeks) | 14 (9) | 14 (9) |
| Time since most recent birth (days) | 401 (177) | 327 (193) |
| Fear of movement | 20 (5) | 22 (6) |
| Total pain whilst running | 5.9 (6.3) | 7.3 (7.5) |
| Delivery mode | | |
| Vaginal (unassisted and assisted) | 69.7% (n=166) | 76.0% (n=316) |
| Caesarean | 31.3% (n=72) | 24.0% (n=100) |
| Perineal tear | | |
| No | 53.4% (n=127) | 49.5% (n=206) |
| 1st or 2nd degree | 40.3% (n=96) | 42.8% (n=178) |
| 3rd degree | 6.3% (n=15) | 7.7% (n=32) |
| Vaginal heaviness | | |
| No | 72.7% (n=173) | 66.1% (n=275) |
| Yes | 27.3% (n=65) | 33.9% (n=141) |
| Running mileage | | |
| Low | 53.8% (n=128) | 33.7% (n=140) |
| High | 46.2% (n=110) | 66.3% (n=276) |

*Table 3. Means (SD) and proportion (n) of each factor for those that had running-specific stress urinary incontinence (SUI) and those that did not*

| **Factors** | **Running-specific SUI (n=255)** | **No running-specific SUI (n=626)** |
|---|---|---|
| Age | 33.9 (3.6) | 33.6 (3.6) |
| Median number of children | 1 | 1 |
| Time since most recent birth (days) | 377 (192) | 289 (191) |
| Fear of movement | 23 (7) | 22 (6) |
| Delivery mode | | |
| Vaginal (unassisted and assisted) | 87.1% (n=222) | 71.4% (n=447) |
| Caesarean | 12.9% (n=33) | 29.6% (n=179) |
| Perineal tear | | |
| No | 39.6% (n=101) | 53.0% (n=332) |
| 1st or 2nd degree | 50.2% (n=128) | 39.3% (n=246) |
| 3rd degree | 10.2% (n=26) | 7.7% (n=48) |
| Vaginal heaviness | | |
| No | 54.9% (n=140) | 66.5% (n=416) |
| Yes | 65.1% (n=115) | 33.5% (n=210) |
| Running mileage | | |
| Low | 42.7% (n=109) | 46.0% (n=288) |
| High | 57.3% (n=146) | 54.0% (n=338) |
| Pre-pregnancy running-specific SUI | | |
| No | 86.3% (n=220) | 96.6% (n=605) |
| Yes | 13.7% (n=35) | 3.4% (n=21) |
| During-pregnancy running-specific SUI | | |
| No | 69.8% (n=178) | 92.0% (n=576) |
| Yes | 30.2% (n=77) | 8.0% (n=50) |

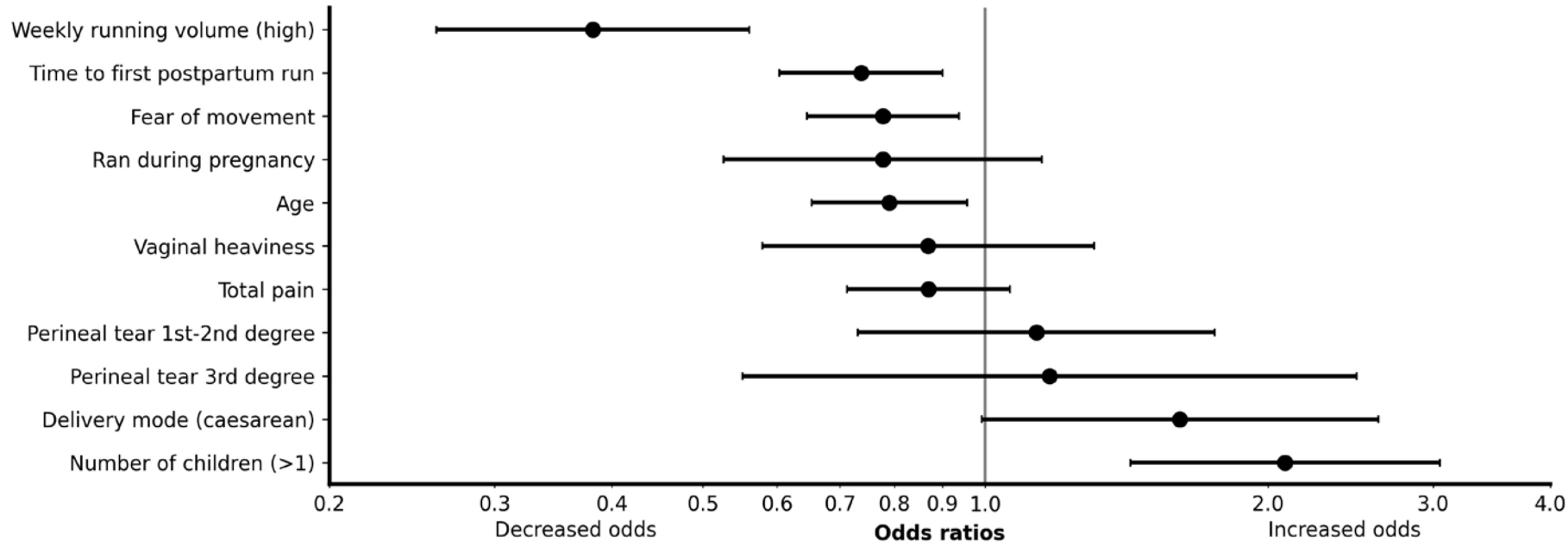


Figure 1. Odds ratios (95% CI) for return-to-running postpartum contributory factors controlling for time since childbirth. Data is presented on a log scale.

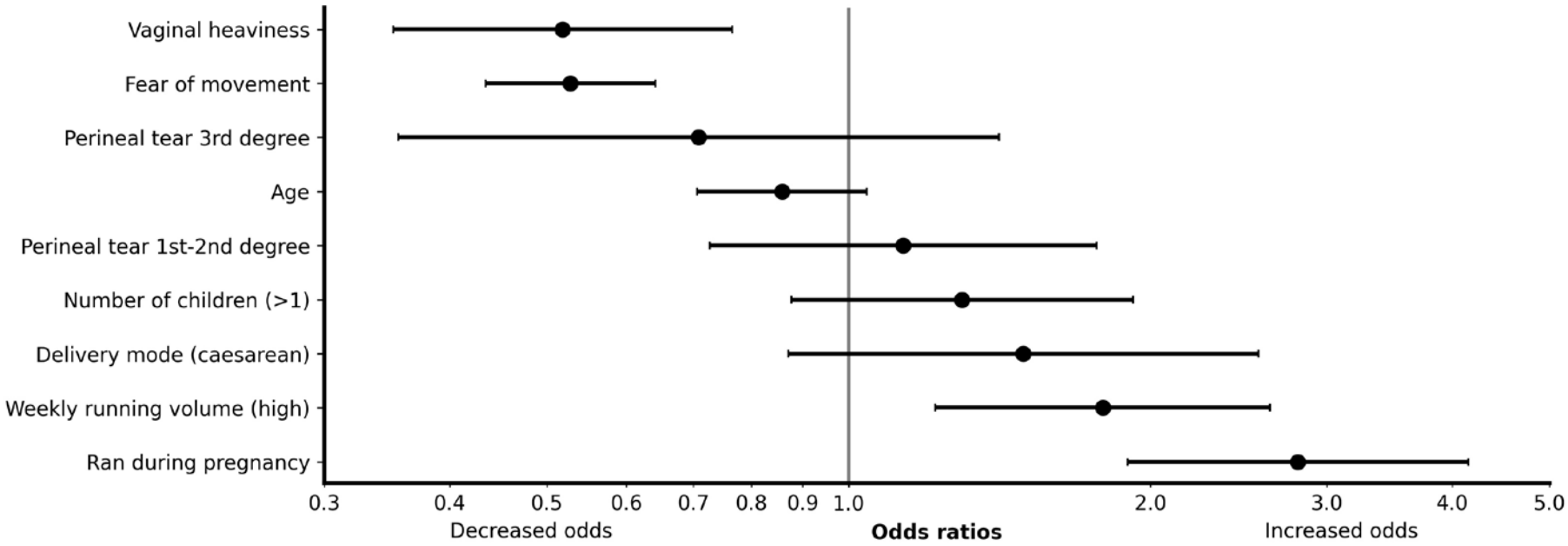


Figure 2. Odds ratios (95% CI) for return to pre-pregnancy running level contributory factors controlling for time since childbirth. Data is presented on a log scale.

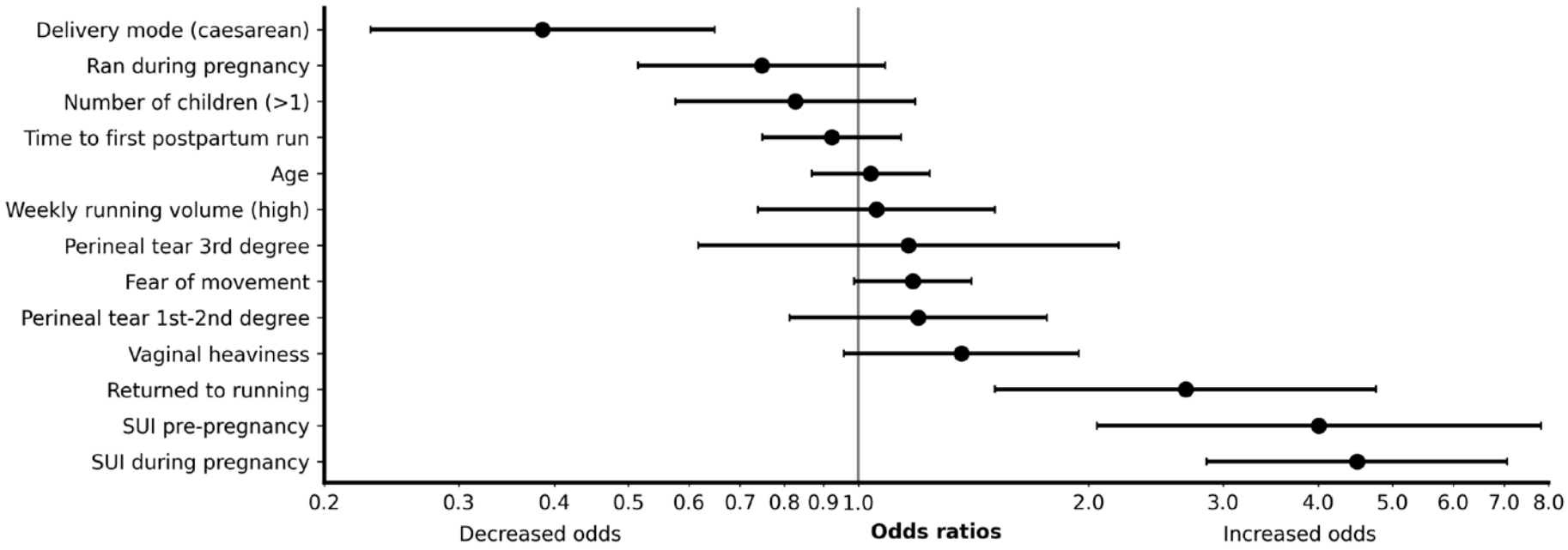


Figure 3. Odds ratios (95% CI) for risk factors for postpartum running-specific stress urinary incontinence, controlling for time since childbirth. Data is presented on a log scale. SUI = running-specific stress urinary incontinence.